ABSTRACT

Title of Thesis: WESTPORT WATERFRONT：
AN ALTERNATIVE APPROACH TO POST-INDUSTRIAL REJUVENATION IN BALTIMORE

Keren Zhang, Master of Landscape Architecture, 2019

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Abandoned post-industrial sites are often seen as a representation of pollution and desolation. The neighborhoods near these sites, which no longer employ the local citizenry, often struggle with crime, unemployment and decaying residential and commercial properties. Nevertheless, post-industrial sites can contain some of the most interesting histories of the city and should be viewed as an opportunity for the local community to redevelop with meaning and purpose in a sustainable way. Like many post-industrial area, the Westport neighborhood in Baltimore struggles with crime, unemployment, housing abandonment and a lack of commercial properties, and is redesigned in thesis to explore how post-industrial site redevelopment can reconnect residents with waterfront and revive communities.

This thesis will explore the options for establishing an equitable, viable and productive community that contributes to the well-being of the existing population through the reuse of the post-industrial waterfront property.

WESTPORT WATERFRONT：AN ALTERNATIVE APPROACH TO POST-INDUSTRIAL REJUVENATION IN BALTIMORE

by

Keren Zhang

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University of Maryland, College Park, in partial fulfillment
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Chapter 1: Post-industrial and Its Development Potential

Introduction

After a two-century long boom of industries, the modified structure of led to the decline of industry and industrial cities. With the decline went, the loss of manufacturing jobs, population decreases housing abandonment and derelict post-industrial sites. The lack of government finance support makes abandoned post-industrial sites become the symbol of contamination and despair. In addition, for neighborhoods adjacent to these sites, the impact of living near post-industrial sites far beyond the depreciation of the property value, which not only directly led to the communities' loss of spirit, but also reduces the quality of life.

The more post-industrial sites have been abandoned, the more notice will be taken of these sites. Most of these sites having been located on the waterways for access to transportation quickly. In the present, the location near water is not just about the easier access to transportation, it also means that these sites have potential to become a waterfront park for residents and visitors. However, because the sites contain a widespread commercial value, developers prefer to transform them as luxury waterfront developments but ignore the needs of the existing residents.

In 2003, Westport waterfront, a post-industrial site located in Baltimore which has over 200-year industrial history, was purchased by Turner Development Group who decided to turn it into a waterfront with luxury residential areas, offices, and hotels. However, the proposed luxury real estates and fancy waterfront are not really connect to the existing neighborhood, but a new insurmountable barrier between them.

Instead of redeveloping post-industrial waterfront as luxury real estate property, this thesis will implement an alternative strategy and explore how to reframe post-industrial waterfront as a driver for community revitalization and an opportunity to create recreational resources and improve economic and environmental conditions. In order to address the issue of reusing post-industrial site to revive the spirit of the Westport community and rebuild the link between the waterfront and community, this thesis project will:

1. Research existing literature on post-industrial cities and sites and investigate various concepts for post-industrial redevelopment.
2. Explore Westport and have a basic knowledge on it in terms of site inventory and site analysis.
3. Suggest a diverse set of design programs to create recreational, ecological, economic and educational opportunities along the waterfront, and create connections between community and the waterfront.

Introduction to Post-Industrial

Post-Industrial City

With the influence of globalization, technological level advances and economic transformation, around the mid-1970s, industrial cities in the United State and around the world were facing the issue of industry decline (Dewar, 2013). Industry decline caused manufacturing job losses, which further led to population loss, housing abandonment and decaying infrastructure (Armstron, 2012). In the early 2000s, the decline of industrial cities has continued; residents left cities and moved to suburbs

looking for better housing and living conditions, abundant natural environment, better infrastructure, and safer neighborhoods (Dewar, 2013).

In traditional industrial cities, the landscapes were shaped by industry demands and layouts (Mirea, 2011). Railroads, highways and industrial zones were built to support industrial development and improve production capacity (Gillem, Hedrick, 2012). Residential areas were created near industrial zones to offer a convenient living environment for workers. However, with industrial decline, the long distances and mass goods transportations decreased, the road and railway systems were converted from industrial use to other purposes or fell into disuse. The former industrial sites have become unwelcoming and neglected, forgotten areas. The nearby neighborhoods were losing their former advantages, some of them were separated from city center due to the obstruction of the highway and railway system and the loss of redevelopment opportunities.

Industrial History of Baltimore and Its Current Condition

The industrial history of Baltimore City can be traced back to 1752. Previously, Baltimore was an obscure town trading in tobacco and with just 25 buildings (BCPC, 2009). The rise of Baltimore started with the shipping of flour to Ireland; the reason for its success is that Baltimore has an excellent harbor and was adjacent to an expansive wheat field. As a result of a large number of immigrants and large-scale exportation, the structure of the economic power of Baltimore was strengthened (BCPC, 2009). The economic power of Baltimore city strengthened during the Revolutionary War. Baltimore contributed to victory by not only building and providing ships, but also keeping the access to trade routes open. The victories of war

and trading resulted in a further growth of Baltimore from around 600 houses in 1774 to 3,000 houses in mid 1790s (BCPC, 2009). After the war, the infrastructure development in Baltimore, such as road organization, street lighting and harbor dredging, helped lay the foundation for the city's rapid economic and population growth over the following decades (BCPC, 2009).

In the beginning of the 19th century, population growth, city expansion, and port development led to increased trade. For instance, the highway system was extended to the Ohio Valley and various industries, like grist mills, saw mills and iron and glass factories were built near or in the city. In 1827, Baltimore became one of the fastest developing cities in the world, and in 1830, Baltimore became the second largest population cities in America, with a population of around 80,000 (BCPC, 2009). In order to compete with other canal transportation areas and consolidate their trading status, the city began to develop railway transportation. As Baltimore's railway system expanded, so did the scope of the city with its different types of industries. In addition, from 1850 to 1900, the population increased from around 170,000 to 500.000, while the urban areas expanded from ten to thirty square miles (BCPC, 2009). To accommodate this growth, the city implemented different strategies to improve the infrastructure, expand the electric networks, and offer convenient public transportation. In 1904, the city invited the Olmsted Brothers' Landscape Architects firm to create a complete park system for Baltimore, but this plan was interrupted by a fire that destroyed the downtown of Baltimore in just one day (BCPC, 2009). Rebuilding the city took about 10 years; however, World War I brought difficulties to the city as well as the opportunities. The war prevented the flow of immigrants from

Europe, leading to a labor shortage, while normalizing the work system and providing job opportunities for women and African American (BCPC, 2009). In 1918, another city expansion was implemented, which enlarged the city from 30 square miles to almost 90 square miles. World War II provided development opportunities for Baltimore, but also foreshadowed the subsequent decline of the city. Because of the demands of the war, the city consolidated dozens of factories to form industrial parks, which enhanced productivity and also brought people together in the downtown area. However, as the population reached a peak of 950,000 in the 1950s, Baltimore City suffered from population loss due to the loss of manufacturing jobs and suburbanization (Friedman, 2003). Seeking better living conditions, residents moved out of the downtown area and local businesses relocated to the suburbs, transforming the prosperous city into vacant land. In addition, the decline of industries followed the end of the war. Between 1950 and 1990, 75,016 manufacturing jobs were lost in Baltimore City, which made up to two-thirds of the total manufacturing jobs. The main reason for this is the decline of Bethlehem Steel, one of the largest employers in Baltimore City. At its highest production level during World War II, it employed 45,000 employees (Friedman, 2003). Under the influence of the loss of jobs, the shift in the direction of the economy, and the decline of the city, from 1950 to 2000, Baltimore City's population decreased from a high of almost 950,000 to just under 650,000, a loss of over 300,000 residents (US Census). As a result, a large number of vacant houses and abandoned properties began to accumulate outside downtown Baltimore City.

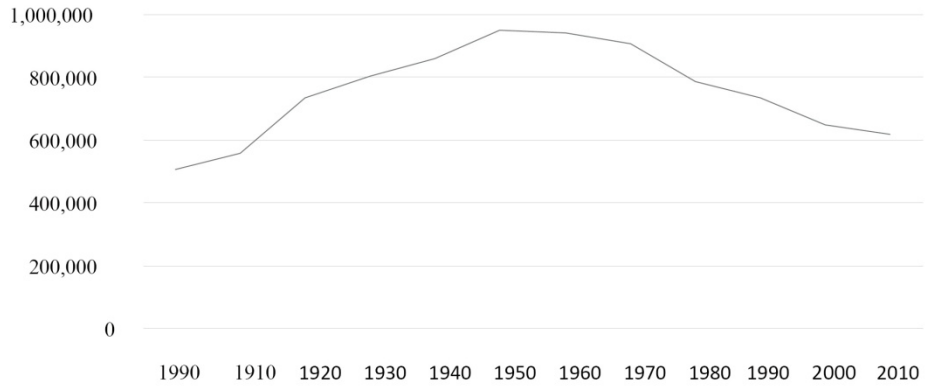


Figure 1: Resident Population in Baltimore City, MD, 1990-2017

Post-Industrial Sites

Definition of Post-Industrial

According to Kirkwood, the post-industrial sites can be understood in three ways.

1. These sites were shaped and influenced by the industrial process or disposal of waste that can be found in traditional industrial cities. Even though these sites are abandoned and ignored, they still have great potential to be developed as recreational amenities for the nearby communities (Kirkwood, 2001).

2. These sites are often seen as representative of the pollution; therefore, they need to be cleaned, using different techniques before reusing them. This definition is related to the manufacturing process which caused these sites to be polluted. These environmental issues often cannot be seen by the naked eye, but involves a diverse set of pollutions, including air, water, and soil pollution (Kirkwood, 2001).

3. It also means the former industrial sites have opportunities to be revitalized by using various interdisciplinary approaches. Due to the complexity and growth potential of post-industrial sites, the design solution to reuse these sites needs to

consider the ecological, economic, recreational, aesthetic, educational, experiential and other factors (Kirkwood, 2001).

Post-Industrial Sites in Baltimore City

According to Evans Paull, who is the Director of the Brownfield Initiative in the Baltimore City Development Corporation, more than 1,000 acres of urban lands in Baltimore City are occupied by about 100 abandoned post-industrial sites, which account for over one half of the total area of industrial sites in the city (Ding, 2006). Figure 2 shows a map of Baltimore City with the abandoned post-industrial sites. From this map, we can observe that most of the post-industrial sites are located along the waterfront since the former industrial production always depended on water transportation. The development of land transportation and the adjustment of industrial structure are what led to the decline of these former industrial sites.

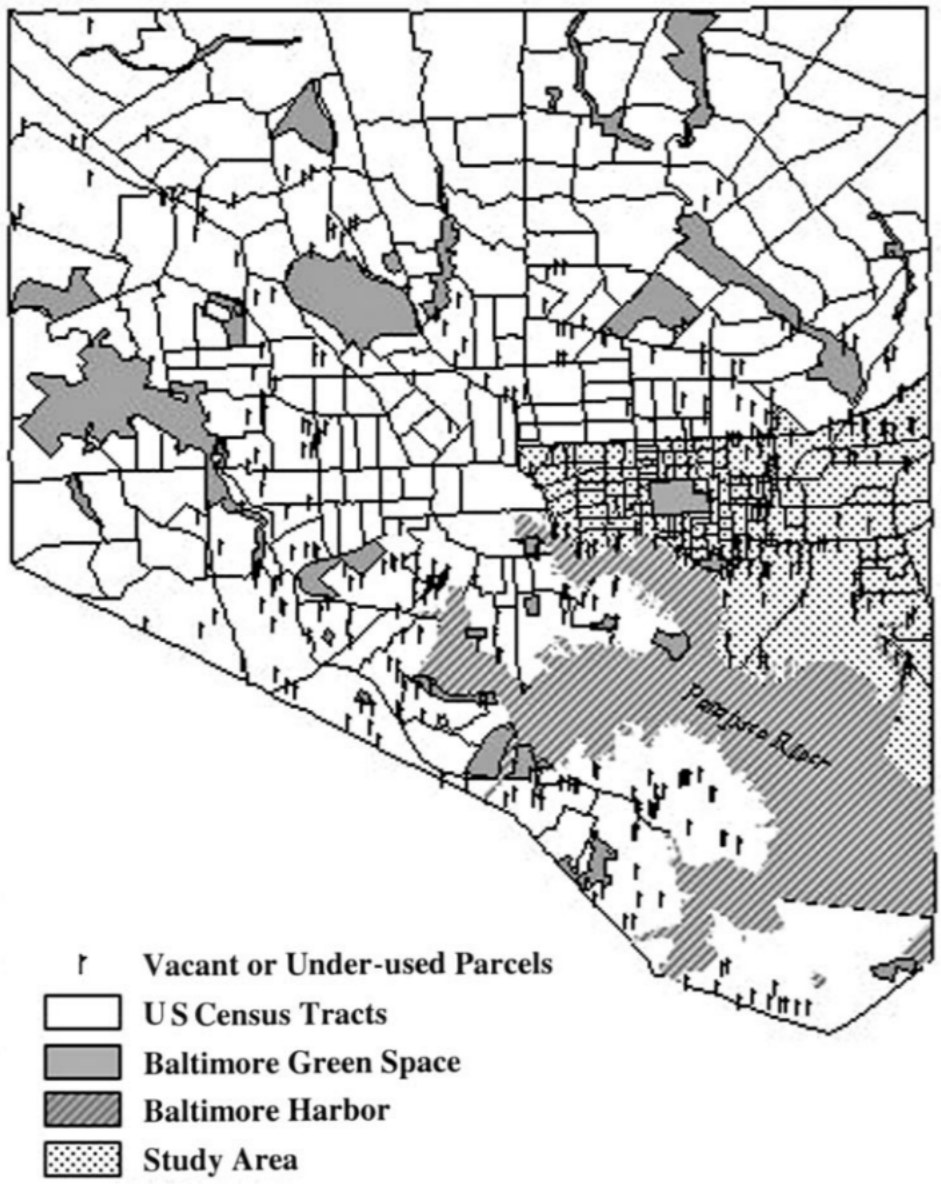


Figure 2: Post-Industrial Sites in Baltimore City. Source: Litt & Burke (2002).

The Influences of Post-Industrial Sites

Post-Industrial Sites' Impact on Environmental and Public Health

When we mention post-industrial sites, the first idea that comes to mind is these sites are representative of pollution, which negatively impact the environment and the

physical and mental health of humans. The development of traditional industry will bring many harmful factors in the industrial production process, which can cause environmental pollution and have a bad effect on human physical health (Ding, 2006). Research has demonstrated that people who live near the post-industrial sites show higher levels in the incidence of cancer and other diseases. In addition, compared to other areas, the pollution of post-industrial sites may cause the high rate of neonatal mortality (Litt & Tran 2002). Post-industrial sites may contribute to homelessness, gangs, and crimes (De Sousa, 2006). They may trigger a chain of reaction. With a high crime rate, residents feel unsafe when they are in public spaces, which cause residents to stay inside their homes and community members not to interact – potentially increasing anxiety in the community. Moreover, the high crime rate will contributr to the decreasing value of property(Watkins, 2010).

Post-Industrial Sites Impact on Economic

Not only do post-industrial sites have influences on environmental and people's health, these sites can also impact local economy. By comparing the damage to the environment and human health caused by post-industrial sites, the influences on the economy are clear and definite. According to the EPA, because of the underused and abandoned post-industrial sites, Baltimore City will lose about $26 million a year in lost tax revenues (Ding, 2006). Abandoned post-industrial sites have a huge influence on the loss of the enormous of economic potential, including the loss of income from commercial properties, the loss of investment in economic development, and the loss of productions of goods and services (Ding, 2006). Besides what is discussed above, the abandoned post-industrial sites will also influence and decrease the value of the

nearby property (Ding, 2006). Moreover, the pollution issues of post-industrial sites make companies unwilling to redevelop and reuse these sites. Though there are some companies that decided to invest and clean post-industrial sites, but due to the high cost of cleaning these sites, , the developers may not receive financial support from insurance companies, financial organizations, or other creditors. Thus, complicated site conditions and financial issues will negatively impact the redevelopment of post-industrial sites (Ding, 2006).

Benefits of Post-Industrial Sites Redevelopment

The benefits of redeveloping and reusing post-industrial sites mainly lie in three aspects: ecology, economy and community improvement. From an ecological point, through environmental remediation, post-industrial redevelopment can reduce 47 to 63 percent of stormwater runoff by transforming post-industrial sites into green space. When development happened at these sites, 32 to 57 percent of the vehicle miles traveled can be reduced. The redevelopment of post-industrial sites can also contribute to the air condition improvement and green gases reduction (EPA, 2019). Transforming post-industrial sites to greenfield can increase urban green spaces and provide recreation amenities for citizens (Minnesota Brownfields, 2016). Post-industrial site redevelopments also increase economic opportunities for cities. Research has shown that the value of residential property will increase by 5 to 15.2 percent after the post-industrial sites' revitalization (Haninger & Timmins, 2014). The financial condition of local governments also can be improved by cleaning and reusing post-industrial sites. A study has shown that local governments can gain $29 to $97 million of additional tax revenue (EPA, 2019). Post-industrial sites

redevelopment also can retain jobs and provide new jobs for the community. According to 2008 research, for every $10,000-$13,000 spent on these sites reclamation, one permanent job will be created for residents. In addition, the cost of public infrastructure reduction can be achieved by utilizing the existing infrastructure to redevelop post-industrial sites (Minnesota Brownfields, 2016).

The post-industrial sites redevelopment can improve community health status by cleaning up the pollution caused by former industrial production. The human settlements quality optimization of these sites can ensure better health for residents, such as the reduction of cancer risk and infant mortality. They also have the potential to improve community safe status. According to De Sousa's research at Mill Ruins Park, an 11.3 percent reduction in crime happened after this site was transformed from an abandoned post-industrial site to a public park (De Sousa, 2009). Residential property value can be improved by redeveloping the post-industrial sites and positively change and people's perspective of the nearby neighborhoods. A study found that the cleanup and redevelopment of post-industrial sites result in a 5 to 15 percent growth of nearby property value (Minnesota Brownfields, 2016). In addition, the redevelopment of these sites can attract new renters and homebuyers, which can infuse dynamism to the once seriously declined area. The redeveloped sites also tie communities together by connecting residents with recreational areas and providing livable spaces for residents to communicate.

Different Design Concepts for Post-Industrial Landscape Development

According to Hofer and Vicenzotti, the difference in design concepts for post-industrial sites redevelopment lies in the various culture contexts (Hofer & Vicenzotti,

2013). They emphasized their opinions through comparing the differences in post-industrial landscape design concept between United States and Germany.

Post-industrial landscape redevelopment is planned with consideration of the potential economic value and the engineering challenges during the design process. There are three main concepts for designing post-industrial sites in American.

1. View the redevelopment of post-industrial sites as an opportunity to achieve economic value, as well as recover and improve environmental quality, rather than pay attention to the preservation of cultural heritage (Hofer & Vicenzotti, 2013).
2. View the cultural meaning of post-industrial sites through a nostalgic lens, for example, the Gas Works Park in Seattle, which was designed by Richard Haag. The design preserved the former industrial ruins, however, due to environmental pollution issue, the idea of utilizing ruins in the future use in the new park system switched to viewing the ruins as a decoration and separating them with the park. The discussion of hazard and liability still is of uppermost priority (Hofer & Vicenzotti, 2013).
3. Recently, a comprehensive approach for creating the post-industrial landscape has been proposed. This design concept not only focuses on the economic value and environmental protection, but it also integrates aesthetic value into the design process (Hofer & Vicenzotti, 2013).

While the American discussion of post-industrial landscape is mainly focused on the economic value and the liabilities caused by unsolved pollution issue, the German discussion pays attention to the cultural meaning of these sites. There are three design strategies for transforming the former industrial site to a new landscape (Hofer & Vicenzotti, 2013).

1. “The idealization of industry”. Instead of viewing the industrial site as the demolisher of landscape, this strategy integrates industrial facilities into the new landscape (Hofer & Vicenzotti, 2013). For example, Duisburg Nord Landscape Park in Germany is designed by Peter Latz and his partners. The old industrial ruins play an important role in this park that help people understand the complexity and necessity of industry and its production process.

2. View the post-industrial sites as a special ecosystem. In general, the former industrial sites often are seen as barren and desolate land. However, research proves that post-industrial sites contain abundant species (Hofer & Vicenzotti, 2013).

3. Regarding the post-industrial sites as wild nature (Hofer & Vicenzotti, 2013).

Chapter 2: Precedent Study

Landschaftspark Duisburg Nord

Duisburg Nord used to be a 230 hectares abandoned post-industrial site that had desperate families, complicated industrial ruins and complex railway system. People who lived near this site often saw it as a "terra incognita" (Weilacher, 2007). However, today the former industrial site is transformed as a landscape park, which was designed by Latz + Partner, a German Landscape Architecture. The designers' main strategies for addressing the post-industrial site have been to carefully think about the relationships between culture, memory and post-industrial landscape. They combined the ruins of a former steel mill to create a landscape park that uses distinct industrial areas to establish a variety of park activities with a diversity of character. Based on the main strategies of using the existing industrial and natural conditions to shape a new interpretation landscape and following the smallest intervention method, the remaining industrial ruins have been preserved and served as park facilities and the site has been separated into six different parks (Figure 3). Among the major elements are a central Blast Furnace Park used for gathering, consisting of the former blast furnace plant and a central plaza; a Railway Park with elevated rail walks, serving as the major connections for the entire park; a Water park with a open waste water canal, which cut through the park from east to west; and a Sinter Park with a flourishing meadow and a festival plaza renovated as event space. The overall park system not only can preserve the historical role and function of remaining industrial ruins, but also can stimulate new understanding of the post-industrial landscape.

Figure 3: Strategies for redeveloping post-industrial site: Blast Furnace Park (upper left), Waterpark (upper middle), Sinter Park (upper right), Railway Park (lower left), Ore Bunker Gallery(lower middle), Adventure Playground(lower right) (landezine.com)

Another important strategy that influenced the design of this site is the method that the remnants of demolished industrial structures could be set aside for road building, concrete recycling and planting substrates. Instead of growing plants on new topsoil, this allows visitors to understand the charms of the park from two aspects: the garden design and the industrial memory (Latz, 2005).

Freshkills Park

Fresh Kills Park is a major civic amenity in New York City, but before the redevelopment, this 2,200-acre landfill site was neglected on the western edge of Staten Island, but even so, there were large amounts of wildlife live in this area due to its history as wetlands and forests. In order to enhance environmental quality and recreational spaces, the site was designed by James Corner: Field Operations for the City of New York in 2001.

The plan and implementation were based on sustainable principles and provide practices that use phytoremediation processes to grow a healthy landscape over time. The design addresses environmental and ecological requirements to the neglected and threatened tidal wetlands and significant wildlife habitats. The ecological design concept for this park is called lifespan, which considers the ecological process that will respond to the environmental restoration and reclamation of a vast polluted land; and to encourage people to customize the park design to suit their needs. Not only can a contaminated land recover a robust and sustainable ecosystem, but the process of involving residents and visitors in the park design can also help to revive the spirit and cohesion of people who will use this new park (Fresh Kills Park: Lifescape, 2006). Therefore, the design also brought social opportunities and economic advantages for people who use and live near this site. The new park area includes various activity areas that provide recreational, educational and cultural opportunities for residents and visitors. The park includes five major areas: the Confluence, North Park, South Park, East Park and West Park (Figure 4), each area with its unique character, distinct environmental habitat and various recreational activities.

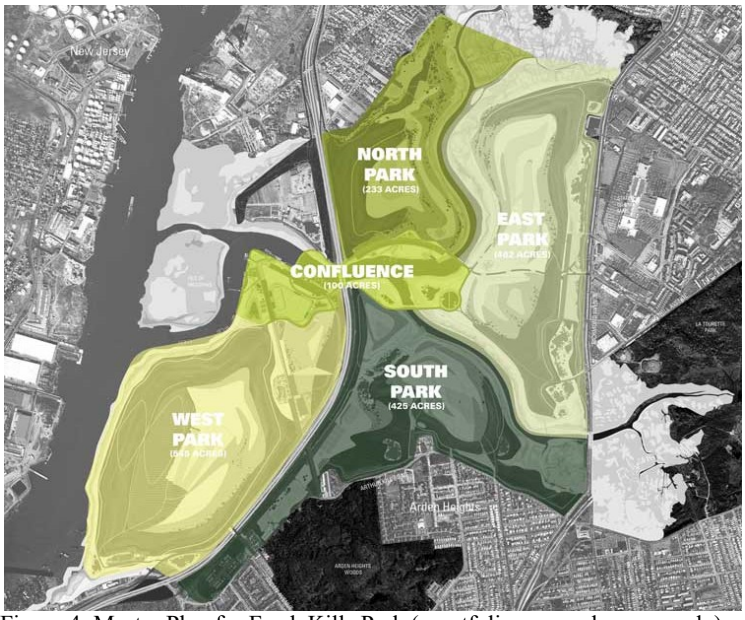


Figure 4: Master Plan for Fresh Kills Park (eportfolios.macaulay.cuny.edu)

In addition, Fresh Kills Park is an interesting example of the incorporation of the traditional and sustainable energy like solar and wind to create a self-sustainable park. First, the garbage will be recycled and used as resources to the steam heat plants, which can provide ample energy for this park and nearby neighborhoods. The new energy, like wind and water power, can provide additional clean energy for this park.

Intervale Eco-Park

The Intervale Center is a non-profit organization that has been operating in Burlington, Vermont since 1986 to address the problems and opportunities of vacant land by transforming 700 acres of vacant land into an urban farm (Figure 5). Their mission is to "implement innovative, replicable and place-based solutions to address some of global agriculture's most pressing problems" (Intervale Center, 2019).
The Intervale was a former farmland, but it became an abandoned place in 1980s, and residents were using Intervale as an informal garbage dump. In 1986, Will Raap

began to clean up the land and restore it as the Interval Center. Nowadays, the Intervale Center achieves its mission by transforming the food system into one that fosters a local food economy for the good of the people and the planet.

The operation of the Intervale Center is based on three high-level organization goals. The first one is to improve feasibility of urban agriculture, thus connecting the existing farm and developing new farmland to form a unified business. The second is to develop sustainable agriculture, meanwhile, to protect and improve the surrounding ecological environment. The third is to engage local residents in the food system by creating various events and programs and offering fresh food to more people (Intervale Center, 2019).

Figure 5: the Intervale Center (intervale.org)

The Intervale Center influences the design of this thesis project by showing how vacant land can be transformed into a productive landscape that uses the existing conditions to create urban farms, build connections with local residents and surrounding neighborhoods and provide job opportunities to attract more people to the newly-developed site.

Chapter 3: Methods

Site Selection

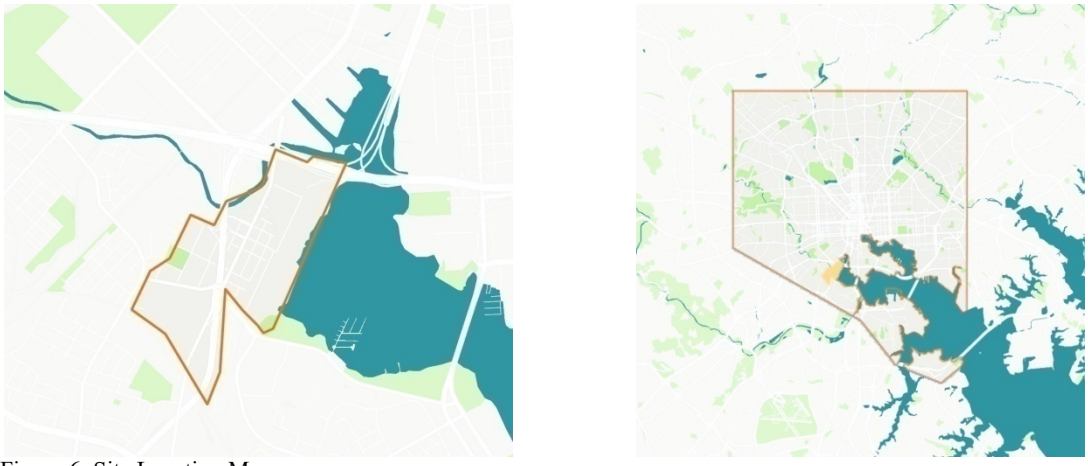


Figure 6: Site Location Map

The neighborhood of Westport is approximately 265 acres and located in the south Baltimore on the Middle Branch of the Patapsco River (Figure 6). This research and design study focuses on a 100-acre post-industrial site on the east side of neighborhood. Westport Waterfront was chosen three key reasons: lack of accessibility and recreational resources, environmental issues and loss of population and job opportunities.

Lack of Accessibility and Recreational Resources

The waterfront's proximity to the downtown Baltimore, Port Covington and Gwynns Falls, indicates that Westport Waterfront has great development potential as an ecological and recreational space for Baltimore City. However, due to the elevated light rail bridge and the Baltimore-Washington Parkway, the site has a lack of connection to the community and surroundings.

Environmental Issue

Westport Waterfront as a former industrial site is faced with water and soil pollution problems, but this site includes three habitat protection areas and has 2,000 miles of shoreline.

Loss of Population and Job Opportunities

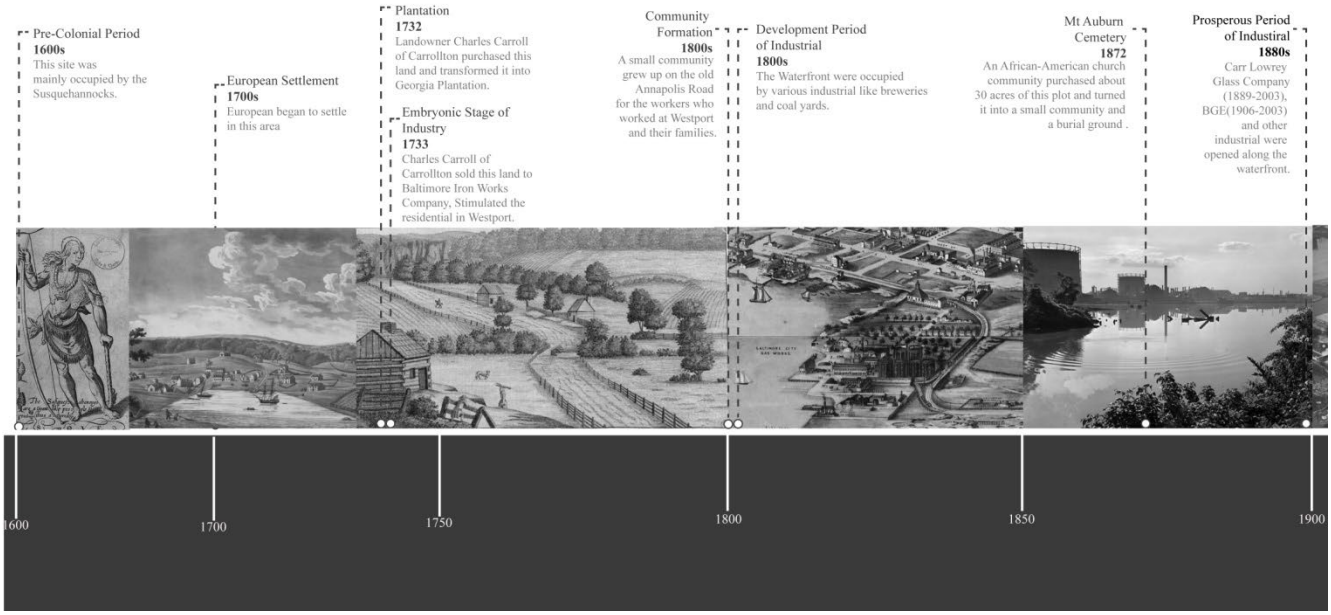
Like many industrial areas, this once proud working-class and majority African-American community suffers from the decline of jobs and financial stability, which means this community cannot attract new residents or keep the existing population.

Site Inventory and Analysis

History

The history of Westport can be traced back to pre-colonial period (Figure 7). Most of this site was occupied by the Susquehannocks people. In 1675, the European settlers came to this new world and established farms in the immediate area. In 1732, this site was purchased by a landowner, Charles Carroll, who transformed this once marshy plot of land into plantation. However, in the next year, he sold this land to the Baltimore Iron Works Company. The waterfront became an industrial site and a small community grew up on the old Annapolis Road for workers and their families. In 1872, an African-American church community purchased an adjacent 30 acres of land and turned it into a small community and a burial ground, which is the present-day Mt Auburn Cemetery. By the turn of the 20th Century, the waterfront was occupied by various industries like the Carr-Lowrey Glass Company and the Consolidated Gas, Electric, Light and Power steam plant, among other small industries, and the

Westport neighborhood expanded on the success of these industrial activities. The construction of the Baltimore-Washington Parkway in the late 1950s marked a transition in both the culture and the economics of the Westport community. Like many other industrial communities in America, Westport lost its sense of continuity, its community connection, its population and its job opportunities, especially after the abrupt changes brought about by the decline of industry in the 1970s.The 1980s and 90s saw a drastic downturn in the community's fortunes. Early into the 21st Century, the industrial land was purchased by Turner Development Group, which decided to turn this site into a major waterfront development in Baltimore: an "Inner Harbor" for the Middle Branch. To this end, the former industrial buildings were demolished in 2003. The proposal for this site went through development study in 2006-2008 but by 2010, due to the economic crisis, the project's progress slowed and was completely abandoned by 2015. Now this site is owned by Goldman Sachs (Baltimore City Department of Planning, 2005).



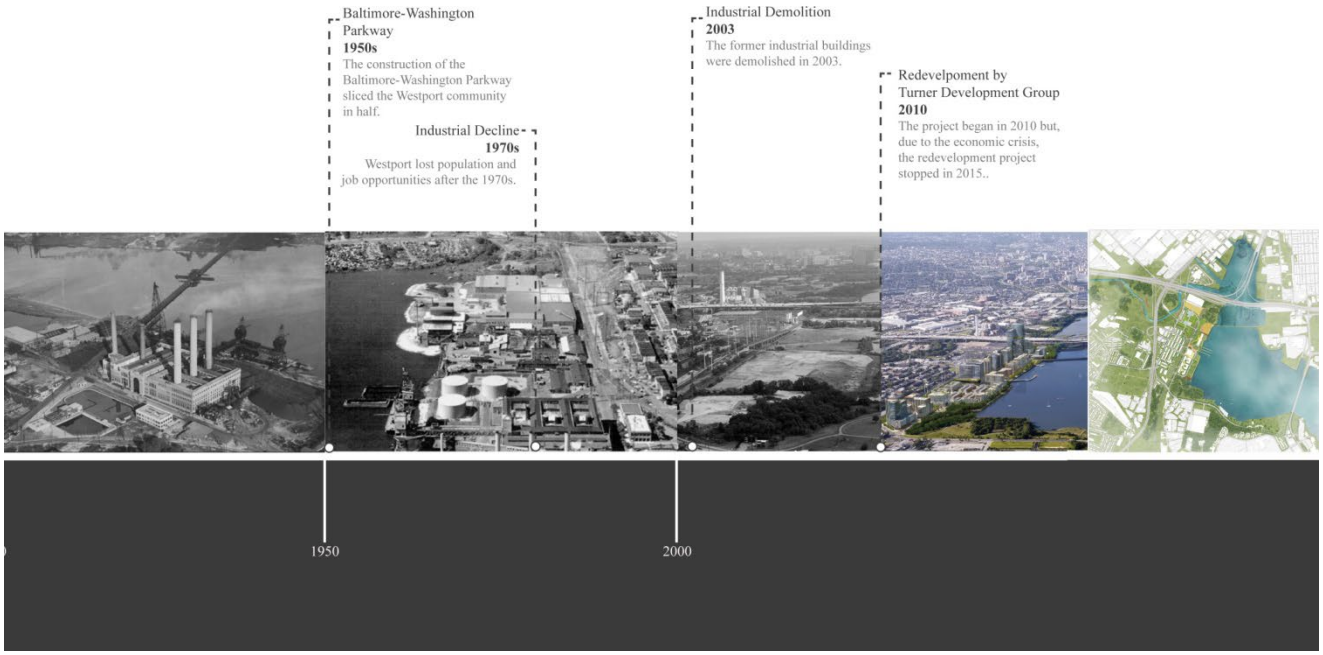


Figure 7: Timeline for Westport (wikipedia.org, docplayer.net, E. Sachse, & Co.'s, mdhs.org, TrainWeb.org, Baltimore City Department of Planning & stvinc.com)

Former and Existing Industries

In order to get access to transportation, the early industrial sites often locate on waterways. The diagram in Figure highlights several former industrial sites that have been demolished in 2003, including Carr Lowrey Glass (1898-2003), the Consolidated Gas, Electric, Light and Power steam plant (1906-2003), and other small industries were all along waterfront (Figure 8). Nevertheless, after people entered post-industrial period, the center of economy gravity has made a big shift to information-saturated, service-oriented economic systems; and advancements of road, rail transport and sea transportation have moved water transport away from historic waterfront (Marshall, 2001). Together, these facts caused the existing industries to cluster in the north of this site and away from the waterfront.

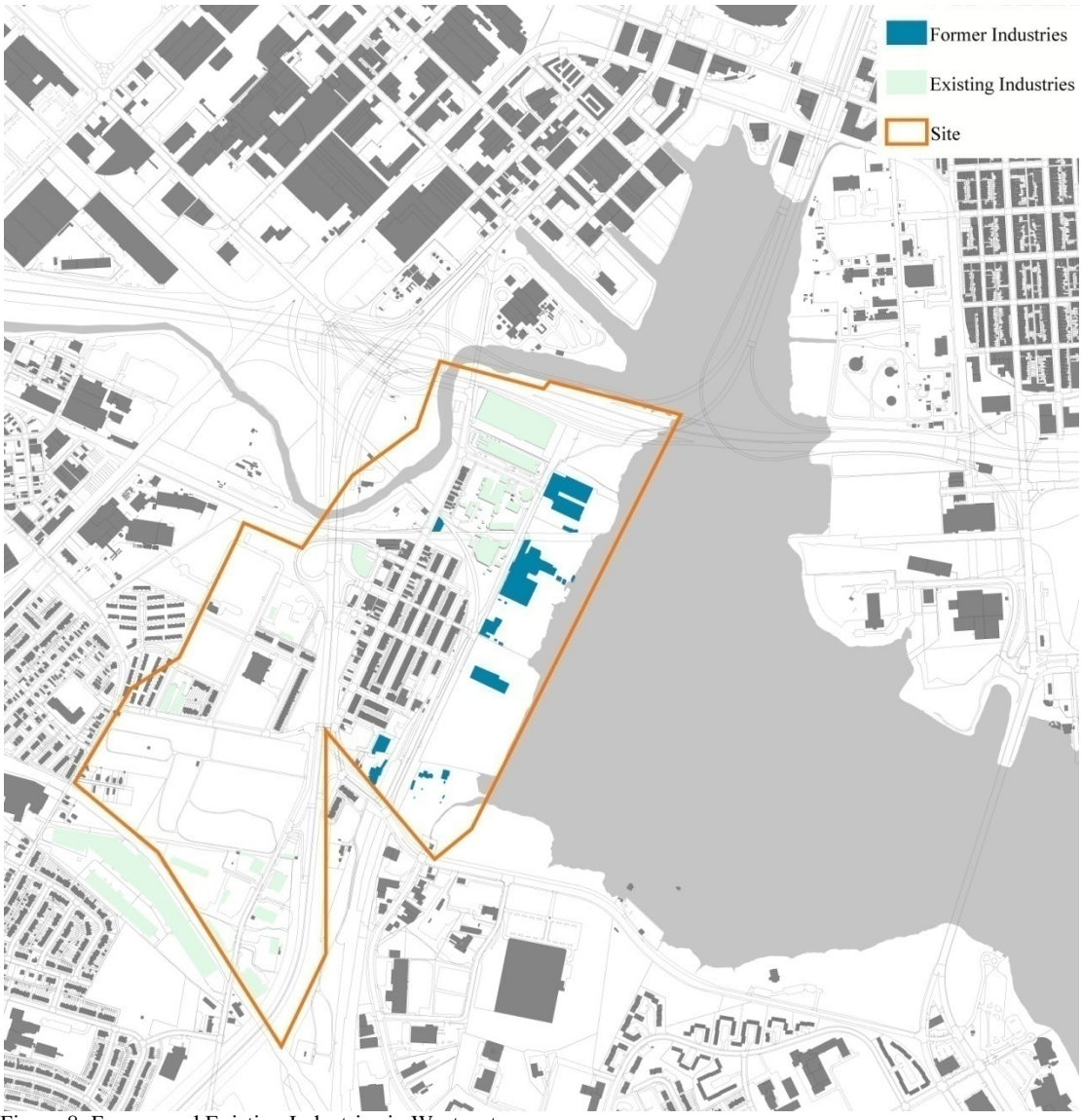


Figure 8: Former and Existing Industries in Westport


Figure 9: Images of Former Industries in Westport (Baltimore City Department of Planning)

Circulation

There are two freeways that cross or are near the Westport community. Baltimore-Washington Parkway (MD 295) sliced the community in half; the only way for residents who live in the west community to access the east community and waterfront is a narrow unwelcoming pedestrian bridge, which is a weak and ineffective attempt toward connection. Interstate 95 is adjacent to the north site and connects the community to downtown Baltimore and Port Covington, and there are immediate vehicular entries and exits for the highway, which makes it easy to flow to and from the neighborhood (Figure 10). In addition, the neighborhood is well served by the public transportation system (Figure 11). The Westport neighborhood is located within walking distance from the Westport light rail station; the light rail connects Westport to downtown Baltimore and Baltimore-Washington Airport. Bus routes along Annapolis Road and Waterview Road also connect Westport to downtown Baltimore and the other nearby neighborhoods. However, the elevated bridge along the Kloman Street blocks waterfront access for the residents adjacent to the waterfront (Figure 12). Even though the residents are living near the waterfront,

the only ways to get close it are from the Wenburn Street or Clare Street to the Kloman Street. Part of the Gwynns Falls Trail runs near and through the site and along Kloman Street (Figure 13). The trail connects the Gwynns Falls to Middle Branch Park, but there is no connection that currently runs along the waterfront area. Therefore, the Westport waterfront needs more access directly connect to the nearby communities, downtown Baltimore, Gwynns Falls and Middle Branch Park.

Figure 10: Vehicle Circulation Diagram

Figure 11: Public Transit Diagram


Figure 12: Image of Light Rail Bridge in Westport

Figure 13: Gwynns Falls Trail in Westport (gwynnsfallstrail.org)

Vacancy Rate

In Westport, the residential units are predominantly row houses adjacent to the Baltimore-Washington Parkway. Industrial decline resulted in the loss of population and the loss of housing stock in this community (Figure 14). Industrial decline in recent decades has resulted in the loss of manufacturing jobs and populations. The rate of abandoned housing units in Westport grew 119% from 1990 to 2000.The

population of this neighborhood decreased by 11% in that same period (Baltimore City Department of Planning, 2005). The pie chart (Figure 15) shows there are 696 units of housing in Westport, 252 units are vacant; the vacancy rate is currently about 36.3 percent. Of the occupied houses, 71 percent are owned by the occupant. Of the unoccupied houses, 77 percent of the owners want to sell their homes but the market is too depressed to realize any significant advantage (Westport Census Data, 2010).

Figure 14: Vacancy Diagram

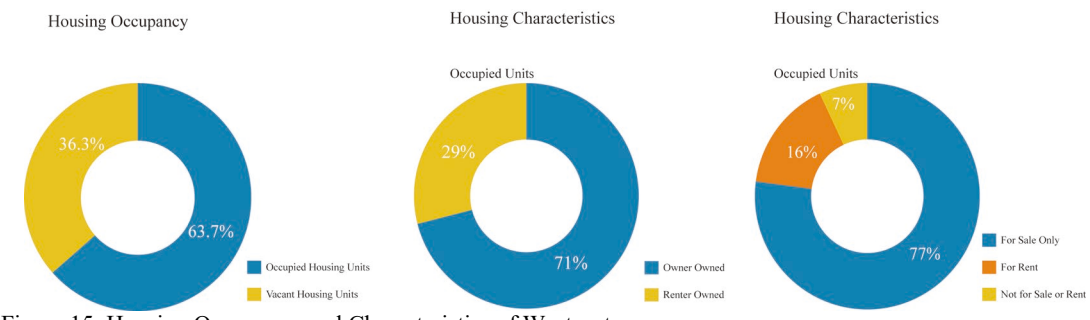


Figure 15: Housing Occupancy and Characteristics of Westport

Food Desert

Almost all the Westport neighborhood is considered a food desert. There is one small market in east Westport and one grocery nearby (Figure 16). However, the Westport waterfront presents an opportunity for creating an urban farm to provide fresh food to the neighborhood.

Figure 16: Food Desert in Westport

Schools and Recreational Resources

There is not a lot of recreational green space in this community. The site includes two parks, a total of 4.7 acres representing 2 percent of the neighborhood land area. One of these is the Florence Cummings Park, which is adjacent to the Westport Elementary School and is located west of the Baltimore-Washington Parkway. The other park is the Indiana Avenue Park, which is a small local park situated east of the Baltimore-Washington Parkway. These two parks have amenities such as playground, baseball fields and benches, but in such small numbers that they cannot provide enough recreational opportunities for residents (Figure 17). The lack of recreational opportunities in the neighborhood making the Westport waterfront area can be built as a very popular and important public amenity for the residents.

In addition, within a 2-mile radius of the center of Westport, there are 50 acres of park space, 4 schools, and several educational centers (Figure 18). By repurposing this Westport waterfront as a recreational space with various educational opportunities and environmental programs, and by creating physical and emotional connections between the site and its surroundings, many problems can be solved. The Westport neighborhood could address the problem of lack of recreational spaces; all of the nearby schools could benefit from the environmental and educational programs. The surrounding parks, educational center, nearby neighborhoods and downtown can be connected with Westport.

Figure17: Parks and School in Westport

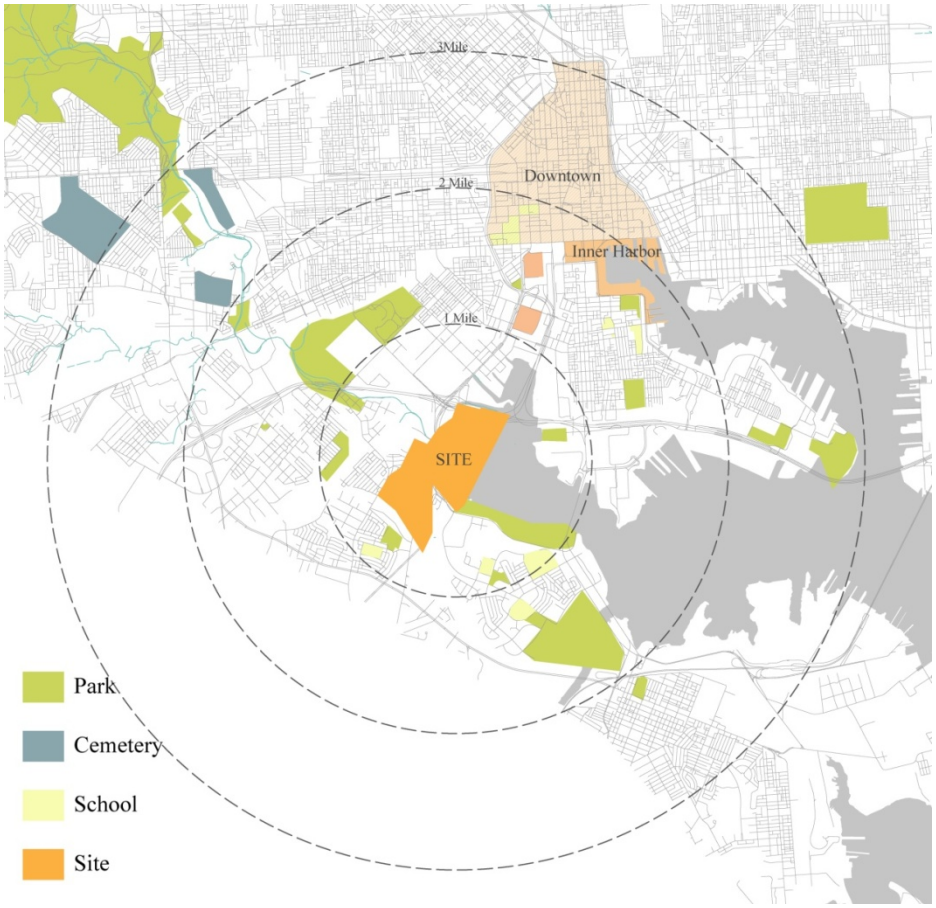


Figure 18: Context map of Westport in 3-mile Radius

Ecological Context

The diagram in Figure 19 indicates that the northern part of the site is in a 100-year floodplain, but most of the site is out of the floodplain.

Figure 19: Floodplain Map

The Westport waterfront has more than 2000 feet of shoreline within the Chesapeake Bay Critical area which includes three habitat protection areas: the Upper Middle Branch, the Gwynns Falls and the Lower Middle Branch (Figure 20). The Upper Middle Branch is a historic waterfowl staging and concentration area, adjacent to a muddy area created by sediments from Gwynns Falls. The Gwynns Falls is a wildlife

corridor that connects the upland forests of the upper Gwynns Falls Watershed with the wetlands and tidal waters of the Upper Middle Branch. The Lower Middle Branch includes a tidal stream and a tidal wetland (Baltimore City Department of Planning, 2011). These habitat protection areas can be connected together by pedestrian paths and serve as environmental centers for the residents and the nearby school.

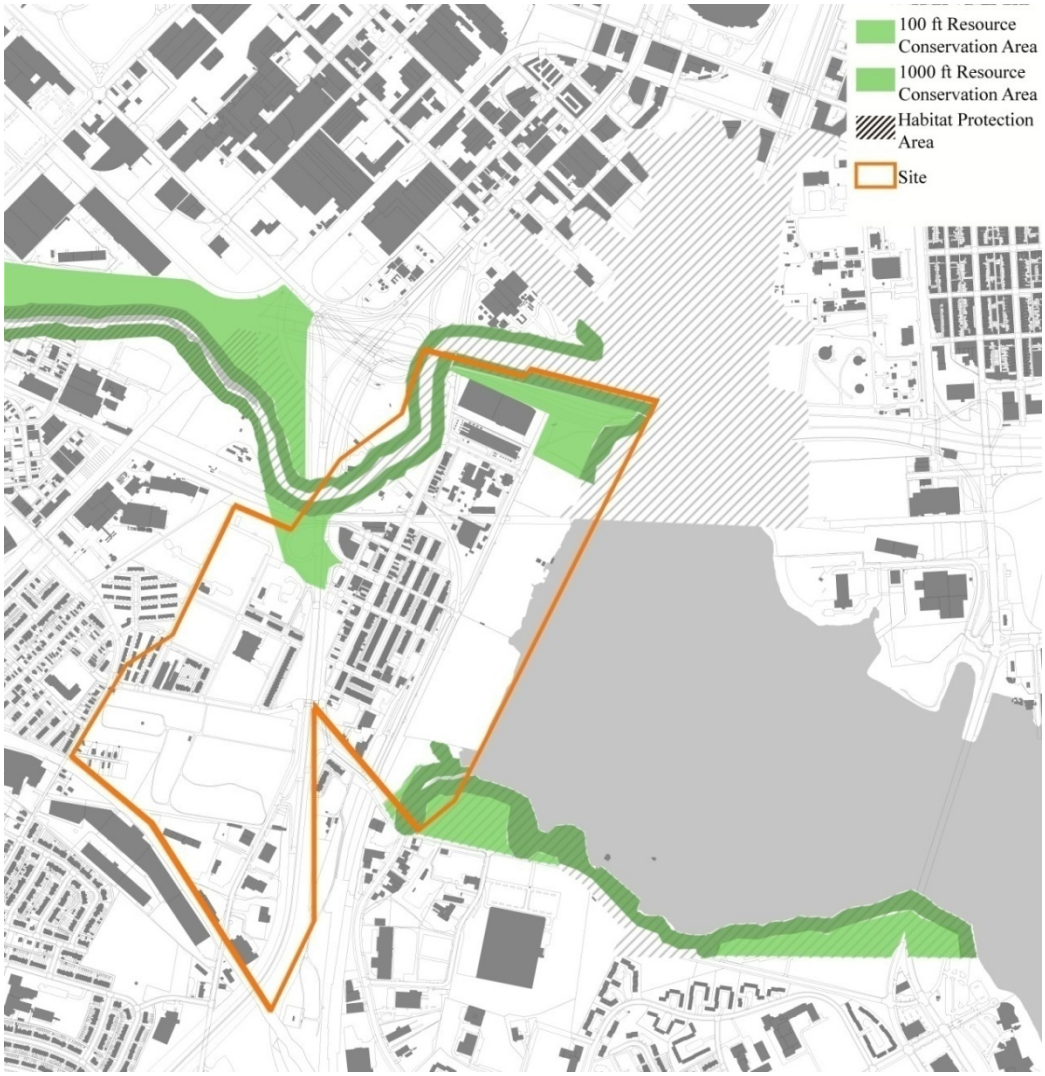


Figure 20: Critical Area and Habitat Protection Area in Westport

Slope

Most of this site is relatively flat, with slopes between 0 to 12%. However, the slope near Indiana Ave Park is over 20% with an elevation change of 16 feet (Figure 21). In addition, the steep slope along the south side of the Light Rail is 28% with an elevation change of 28 feet. These steep slopes pose challenges for ADA accessibility and drainage. There is a need to regrade and adjust the slope and combine with a bridge or ramp to establish better connectivity, as well as considering stormwater catchment facilities to deal with the runoff.

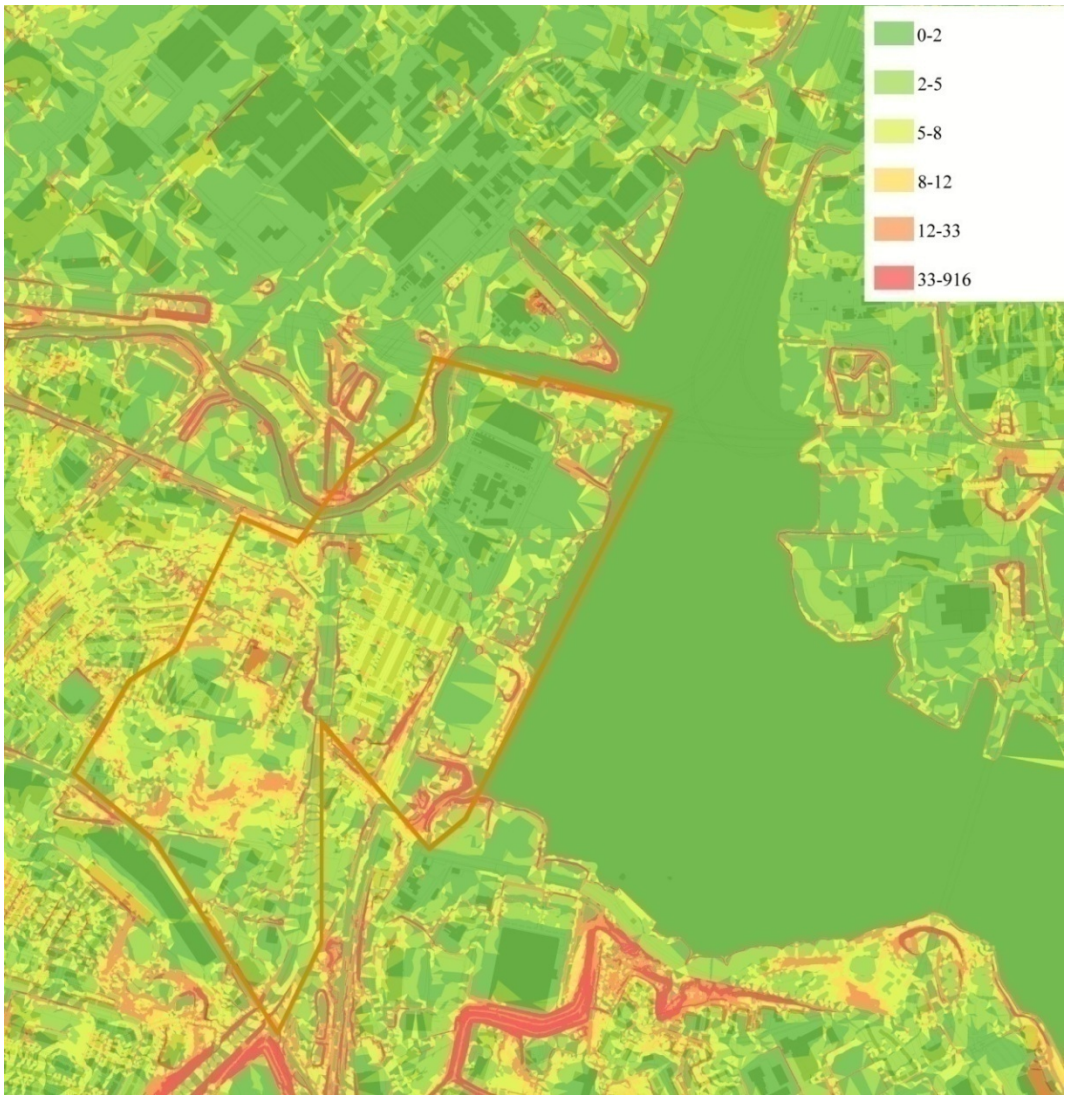


Figure 21: Slope Diagram

Soil Analysis

There are six different types of soil on this post-industrial site. The majority soil of the site is “44UC—Urban”, with 0 to 15 percent slopes (USDA, 2019). Most of the site is covered by hydrologic soil group C and D, which means the soils have low infiltration rates and high runoff potential. In addition, the long-term industrial developments have caused severe soil pollution. Cleaning and reclaiming soils in the post-industrial site will need to take place in order to implement new strategies that ultimately contribute to the Westport Community.

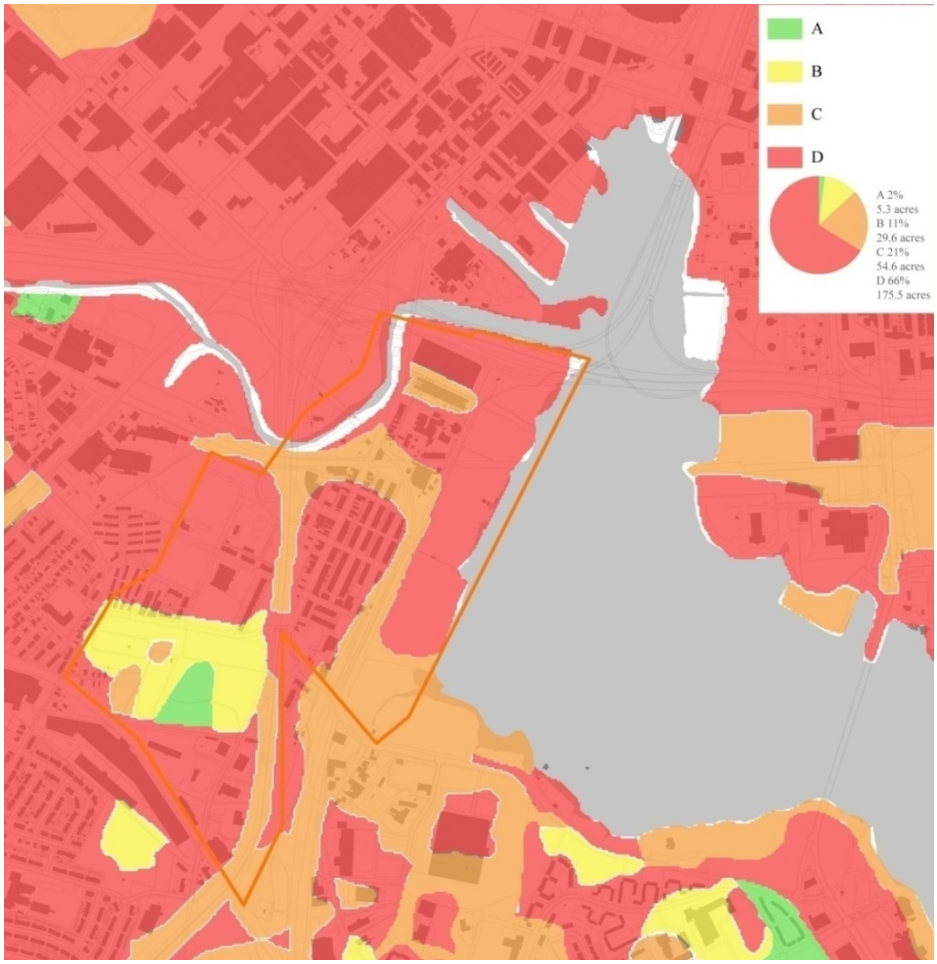


Figure 22: Soil Hydrologic Group Diagram

Recent Proposed Development for the Westport Waterfront

As previously mentioned, Turner Development Group proposed that this site be turned into a new Inner Harbor for Baltimore City (Figure 23). This new development, which proposed residential units, office space, retail and restaurants, and structured parking spaces, was also intended to create an intertidal wetland along the waterfront area (Turner Development Group, 2007). The project began in 2010 but stopped in 2015, due to economic crisis. The site was sold to Kevin Plank's Sagamore Development and then, to Goldman Sachs (Sherman, 2015).

Figure 23: Proposal for the Westport Waterfront by Tuner Development Group

Turner Development Group's Plan Review

The design proposed for this thesis is different from the Turner proposal in a number of ways.

First, Turner proposal calls for a reconstructed connection for the existing neighborhood to access the waterfront. While the high-raised hotel/ retail building are mostly concentrated in the north waterfront, located in front of the BGE substation, this is not so much visual obstruction between the existing community and the Westport waterfront. However, the existing community seems to be separated from the waterfront due to uneven development. In an effort to build a true connection with the existing community, the proposal should address the need for connecting the waterfront with the existing waterfront and provide more opportunities for the existing neighborhoods.

Second, there is no unified connection in the Turner's proposal for connecting Westport with its surroundings. In addition, this plan separates the waterfront with the nearby natural resources from its surroundings. Because the waterfront includes three habitat protection areas and connects to Gwynns Falls and Middle Branch Park, it seems like this could be a good opportunity to develop an ecological and educational connections to connect the waterfront with city and to attract more citizens to live and visit the waterfront.

The final different with Turner proposal for the Westport waterfront is the recreational areas along the waterfront area. The recreational spaces in Turner proposal are mainly concentrated on the north side, between the proposed hotel/retail building and multi-family housing units. This plan may not create a comfortable

recreational area for visitors and residents, because this area is adjacent to the BGE substation. A concentrated recreational area cannot attract people to explore the whole waterfront area, and the existing industrial site near the waterfront cannot form a welcoming environment for citizens. The design should explore alternative strategies for increasing the recreational and educational opportunities along the waterfront and find an eco-industrial development method to revive the waterfront, and create a more welcoming and desirable condition for the waterfront and the existing community.

Chapter 4: Design Concept and Program

Design Challenges

Based on research, site inventory and site analysis findings, there are several design challenges the design will need to address:

1. Lack of accessibility
2. Lack of recreational opportunities for the neighborhood
3. Loss of the population
4. Low employment rate

Design Goals and Objectives

To address these challenges, the following goals and objectives were created:

1. Improve the connectivity both at the site scale and the large context scale
    - Objective 1: Create physical and viewing connections from the existing neighborhood to the waterfront
    - Objective 2: Create water transportations, pedestrian paths and various educational programs to improve the connectivity at the large context scale
2. Attract various people to live near the waterfront and connecting the existing residents
    - Objective 1: Build waterfront recreational spaces for all ages and abilities
    - Objective 2: Enhance experiential diversity
    - Objective 3: Build a new mixed-income community

Objective 4: Create courtyards and community parks to connect existing and proposed residential areas;

3. Create production landscape and treating the design as a driver for future development

Objective 1: Implement urban agriculture in the waterfront to create jobs

Objective 2: Repurpose existing industrial building as food hub to provide training exercise and to produce residual productions

4. View the design as a part of a larger ecological system

Objective 1: Restore and protect existing habitats and create educational spaces near the waterfront;

Objective 2: Treat stormwater and reduce railway pollutions

Design Program

In order to revive the Westport community and build connection between the waterfront, the existing community and the rest of Baltimore City, a unique program that couples community with recreational areas, urban farms, a proposed community development and an environmental center was developed in the nearly 100 acres post-industrial waterfront (Figure 24).

This thesis's design program involves encouraging movement between the waterfront, community and its surroundings, creating various experiential spaces that stimulate the communication between people in the community, as well as between people and the waterfront. All of these programs are centered around developing a dynamic and connect waterfront area for everyone to enjoy. The public realm mixed with the proposed residential area offers a comfortable space for the existing and proposed

residents. In addition, after the revitalizations, the public realm will become a welcoming space for visitors. The urban agriculture and environmental center will create the education and job opportunities that also can help to attract people here. The specific functions of these four spaces will be described in the following Design Section.

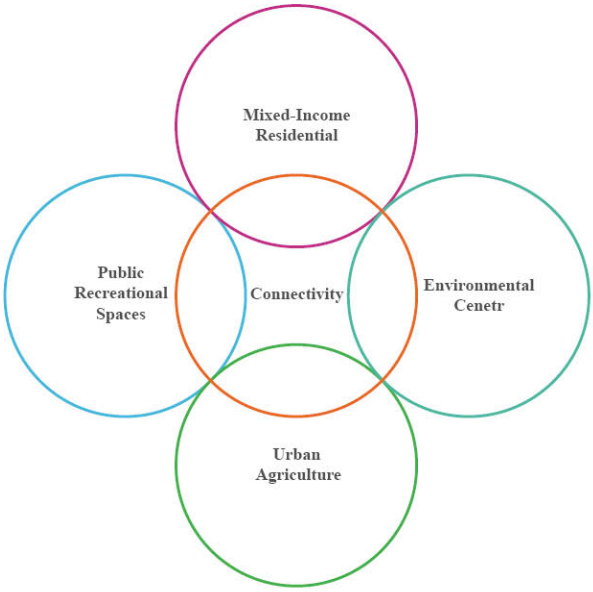


Figure 24: Design Program Shows the Five Main Design Aspects

Chapter 5: Design

Master Plan for Westport and Surroundings

The master plan for Westport and the surrounding areas can be divided into three sections corresponding to different districts (Figure 25). The first section is the Westport community. The second section is Gwynns Falls. The third section is the west part of Port Covington.

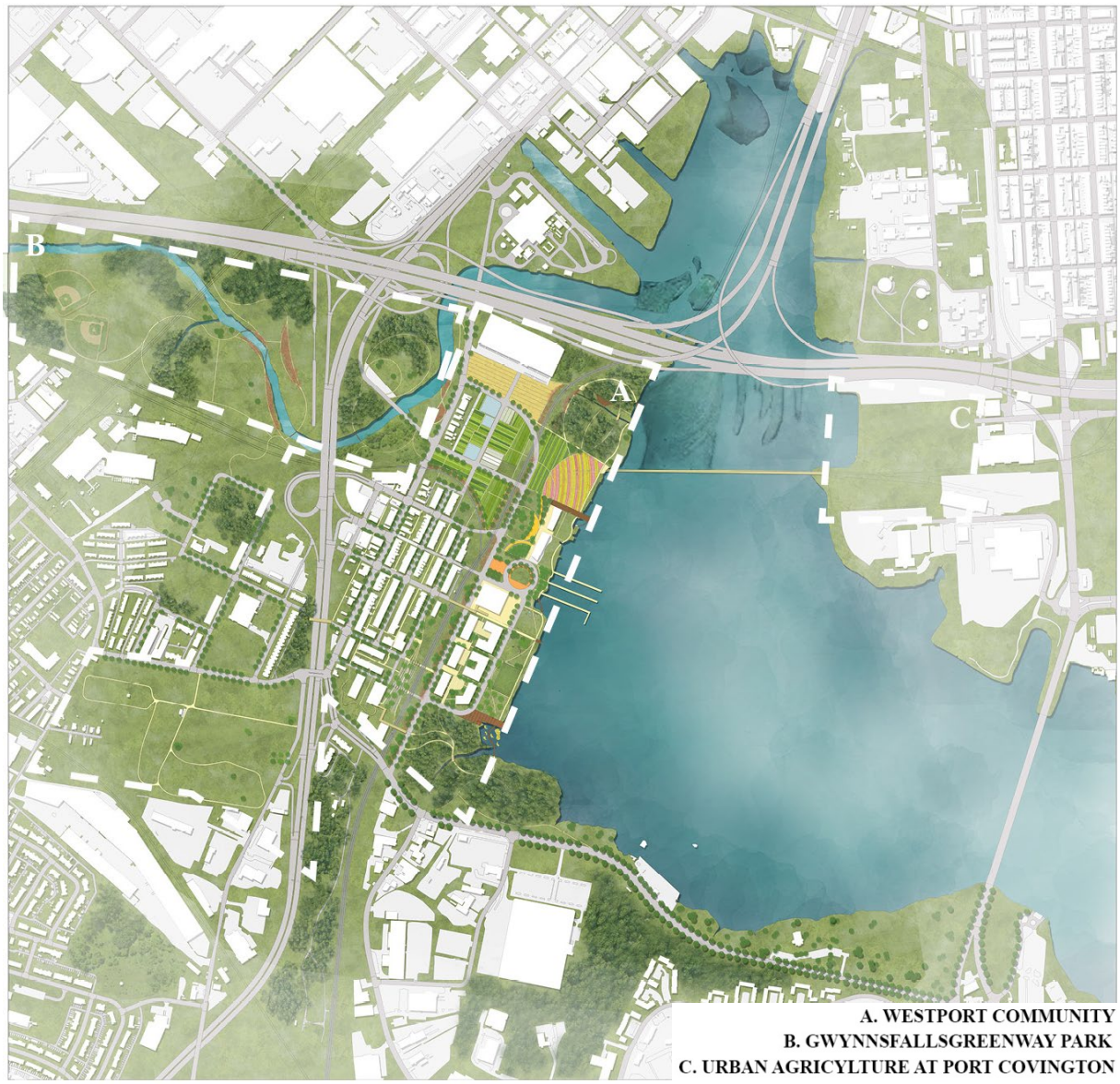


Figure 25: Master Plan Rendering for Westport

Westport Community

The first section is the focus of this thesis, the Westport community. As previously mentioned, it used to be a proud blue-collar and majority African-American community, but lost its past glory due to the decline of industry. In order to achieve the goal of community revitalization, this section is programmed with an environmental center, urban farm, public realm and proposed residential development that can provide recreational, educational, ecological and economic opportunities for the existing and proposed community. Visitors can access this area from downtown Baltimore, the nearby neighborhoods and Port Covington.

Residents and visitors can have a variety of experiences as they walk along the waterfront, collect food at the urban farm, eat at outdoor restaurant, learn the site's history at the visitor center, and rent a boat to explore the Patapsco River.

Gwynns Falls Park

Gwynns Falls is a 24.9-mile long stream located in the north of the Westport community. It flows southwest and enters the Middle Branch of Patapsco River. As mentioned previously, Gwynns Falls is a wildlife corridor and includes several wetlands. Part of the Gwynns Falls Trials crosses the Westport community, but due to the existing industrial site along the stream and the steep slopes between the community and the stream, there is no direct connection between the community and Gwynns Falls.

To account for the existing conditions, this section is highly programmed as a greenway park. It provides areas for active and passive recreation, including entry plaza, pollinator pathway, central plaza, gathering meadow, picnic meadow,

overlooks, and sport fields. The whole park is divided by the Baltimore-Parkway into two parts, and there is a pedestrian walkway under the freeway to connect the two parts. Visitors entering from Annapolis Road are welcomed at the entry plaza, and can explore the two parts of the proposed park. They can also enter from Kent Street at the eastern edge of the Westport community. The proposed ramp that runs across the steep slopes between the community and the stream allows visitors from the community to explore and view the park at the high elevation. The park can offer a variety of experiential spaces for visitors, as visitors wander the walkway along the stream, view the park at the ramp, picnic at the gathering meadow, visually interact with the stream on the overlook and play at the sports fields.

Urban Agriculture at Port Covington

The third section discusses the west side of Port Covington. There is currently a proposal to construct a new residential and commercial development in this area. While the new development aims to create a place that rivals the Inner Harbor, part of this area used to be occupied with hoop houses from Big City Farms-an urban farm organization, and it seems like this could be a good location to place a tree nursery and other urban agricultures uses near Swann Park. Urban agriculture offers different job opportunities, and the program of applying urban agriculture in the master plan could also help to build connections and bring people to this area.

Accessibility Improvement

The Westport community, Gwynns Falls Greenway Park and the west side of Port Covington can be connected by reusing abandoned paths, extending or improving the existing paths and creating new paths. This network of paths offers a comfortable and

welcoming environment for residents and visitors to guide them to explore various destinations in this area. An abandoned rail bridge connects Westport and Port Covington (Figure 26). The design proposes to repurpose the unused railway bridge as a pedestrian bridge, to link these two areas again. The reuse of this bridge will offer pedestrians a quick and pleasing walk and provides a new opportunity for residents and visitors to explore the Middle Branch River.

In order to connect the Westport Community with the Gwynns Falls, downtown Baltimore and other areas, the design plans to connect it with Clare Street. Russell Street in the Westport community, is a dead-end road that leads to the existing industrial site along the Gwynns Falls. This new connection can guide people to this area and provide an opportunity to explore the Gwynns Falls, learn about urban agriculture and meander at the waterfront.

In order to attract residents who live in west part of Westport to the waterfront, the design suggests some connections between the separated Westport community. For example, the design proposes replacing the unwelcoming bridge across the Baltimore-Washington Parkway by a more pleasing and comfortable pedestrian bridge (Figure 26). The master plan also suggests other connections between the Westport community and other nearby neighborhoods, such as connecting the dead end road at the border of Westport and Mt Winans community and creating pedestrian connections to link the Westport waterfront and Cherry Hill Community (Figure 27).

Figure 26: Left: Abandoned Railway Bridge & Right: Pedestrian Bridge Cross Baltimore-Washington Parkway (google.com)

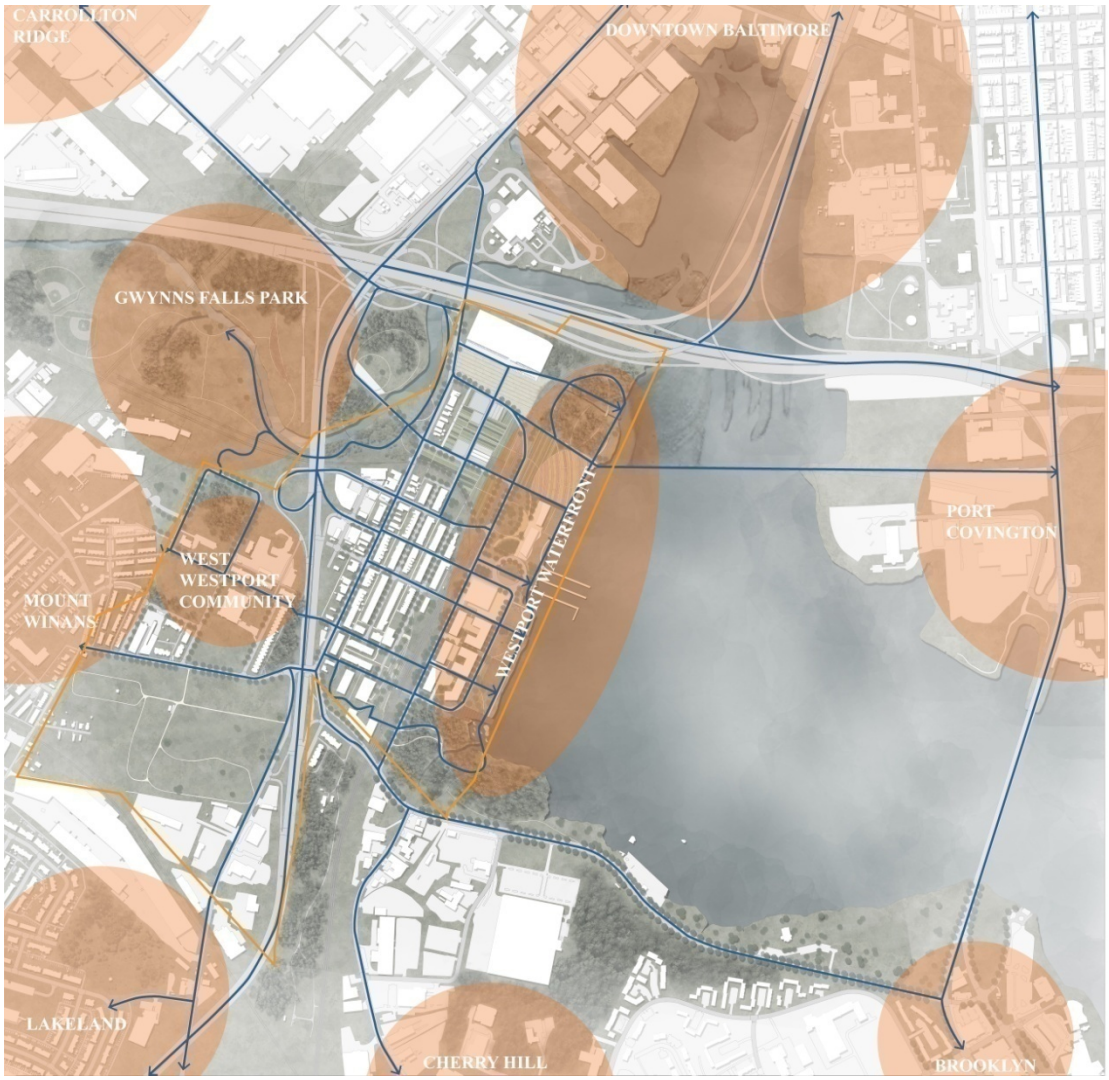


Figure 27: Accessibility Improvements for Master Plan

Site Plan for the Westport Waterfront

As mentioned previously, the Westport waterfront site plan (Figure 28) incorporates four sections: bird habitat and an environmental center, urban agriculture, public realm, and waterfront recreational spaces with a proposed residential development. There is a pollinator path along the light rail line and through the whole site. Not only can a pleasing path bring people and guide them to explore the waterfront, but it can also slow down stormwater runoff, remove chemical pollutants from runoff, provide habitat for pollinators such as birds and other species, make the waterfront more attractive and provide educational opportunities

Figure 28: Rendering Site Plan for the Westport Waterfront

Bird Habitat and Environmental Center

Approximately 11 acres of the waterfront, which is located north of the waterfront and adjacent to I-95, will be transferred into a bird habitat and environmental center (Figure 29). This area is a historical bird habitat along with a muddy area which can

provide the birds with food and water. However, in order to create an enhanced bird habitat, birds need protective cover and a safe place to nest and raise their young; a multilayered bird habitat with native bird-attracting plants will be introduced to this area. The layers of the multilayered habitat include: aquatic habitat, grassland habitat, and woodland habitat. In addition, if creating habitats for birds and other species is the goal but there is not sufficient space, recreating corridor connections is vital for a sustainable ecosystem to support wildlife (Holland & Hastings, 2008). Wildlife corridors are physical connections between two important habitats for wildlife to migrate across habitats with the changing season (Bond, 2003). Connections of habitats can be achieved by the Gwynns Falls Greenway that serves as a corridor to guide wildlife from the waterfront habitat and migrate to the upland forests of the Upper Gwynns Falls Watershed.

In addition, continuous programmed activity areas were created in the Bird Habitat and Environmental Center that bring together neighborhood community and visitors to the waterfront. This section provides areas for active and passive recreation, including a bike lane/ river walk, bird observation towers and an overlook. The bike lane/river walk is comprised of continuous boardwalks and paths which invite visitors to explore the river's edge and engage with the various habitats. The bird observation towers along the bike lane/river walk provide good spots for users to observe birds in aquatic habitats and admire the surrounding scenes at a high elevation. The overlook is a peaceful place near the small cove and is surrounded by beautiful woods that provide a comfortable space for relaxing and recreation. Thoughtfully placed benches and seating areas along the pathways and at the overlook provide moments of rest and

meditation throughout this section.

Educational opportunities were also considered throughout this section and are maximized with various habitats, native wildlife and plants species and a diverse set of educational programs provided. These educational opportunities will benefit the residents, visitors, and nearby schools can also help to build connections with the surrounding educational center to create and develop an educational network for the whole city.

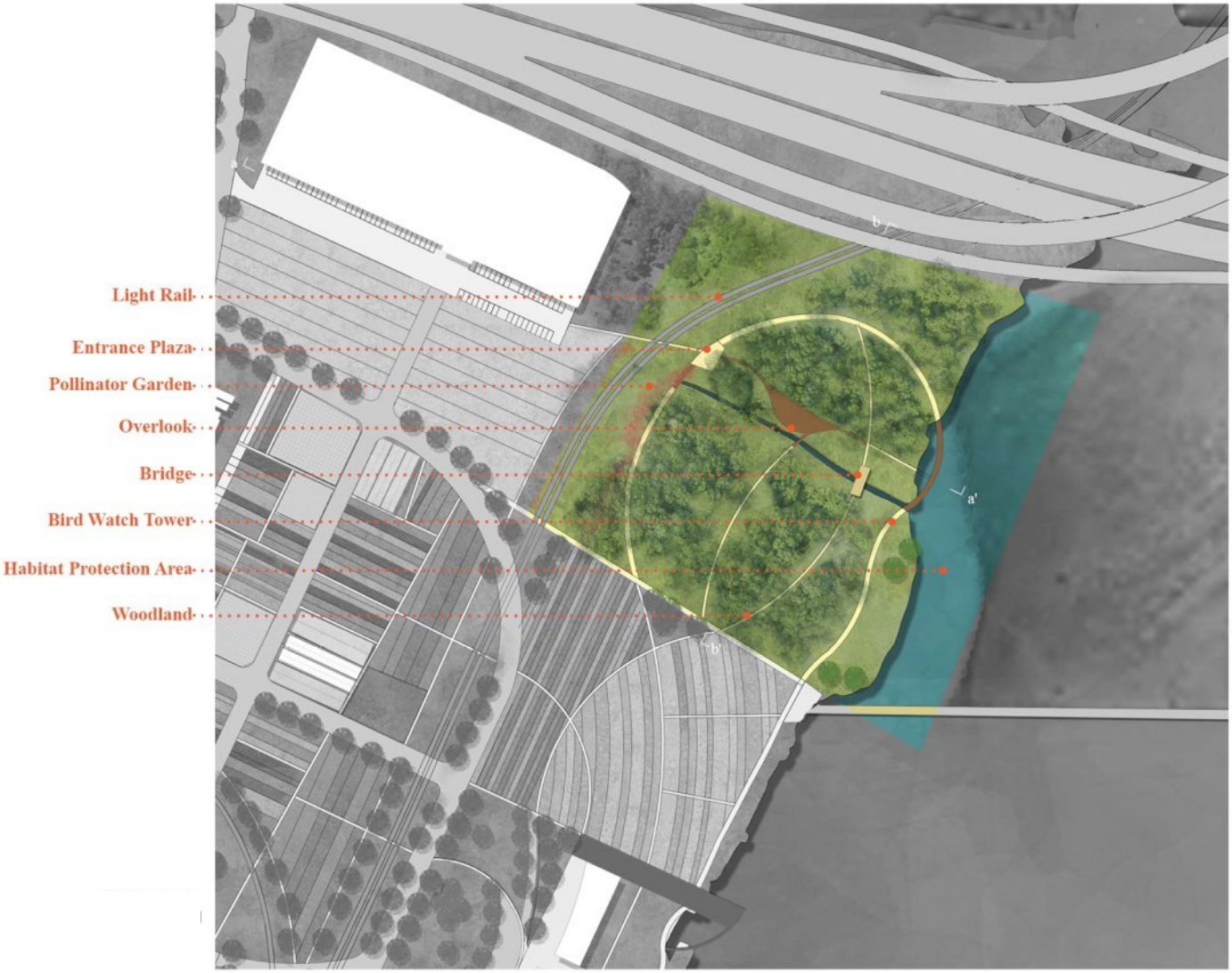


Figure 29: Proposed Bird Habitat and Environmental Center

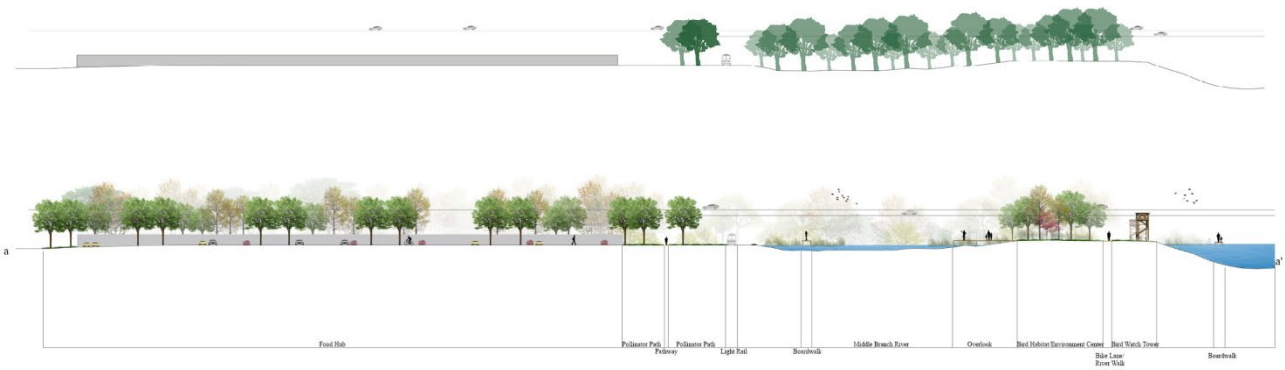


Figure 30: Existing and Proposed Section Cut from the Proposed Food Hub (Howard Company) to Waterfront

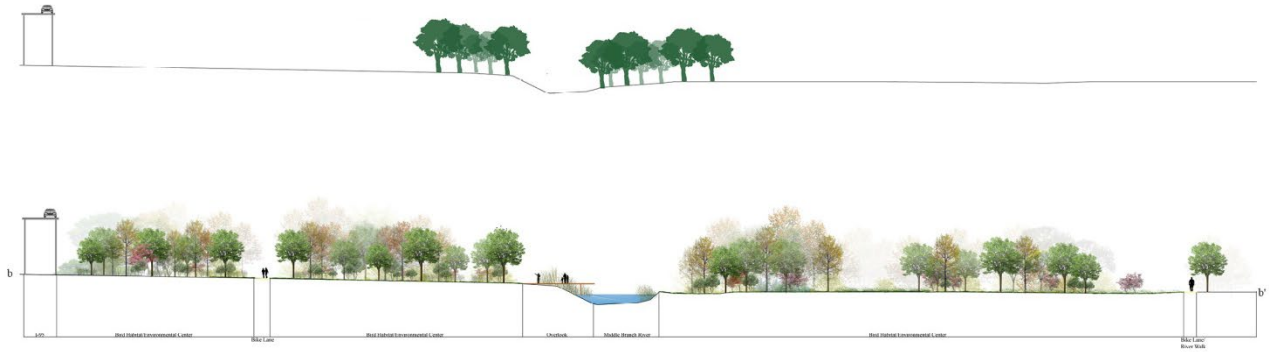


Figure 31: Existing and Proposed Section from I-95 to the Proposed Urban Farm

Urban Agriculture

This design section focuses on developing a strategy for enhancing the relationship between residents and the waterfront by integrating urban agriculture with a post-industrial site to create a diverse set of economic opportunities. This section is located at the south side of the bird habitat and environmental center, adjacent to the existing neighborhood (Figure 32). The proposed urban farm includes a diverse set of crops, including vegetables, flowers, algae, grains, and herbs, to ensure greater agricultural biodiversity. Ongoing production and maintaining quality can be achieved by applying greenhouses and hoop houses on the site. These facilities can provide sufficient heating to protect plants in cold weather. The waterfront is close to Wheelabrator Baltimore, a waste-to-energy incinerator, which could provide ample,

affordable heat for greenhouses and hoop houses. Tidal power also can provide additional clean power to the urban farm. Building a community garden on the site will also help bring residents and the waterfront together; it can also provide fresh food to the neighborhood and help to build a healthy eating habit. After harvest, the urban agricultural produce can be cooked or sold on-site, delivered to shops and markets or processed in a food hub to get residual products. The waste of urban farming can be recycled by the energy plant.

The existing industrial building was transformed into a food hub for producing, distributing, and selling food products and could offer agriculture training or cooking class to connect neighborhood residents.

In general, the almost 30 acres of urban farming not only provides fresh food to neighborhoods and local residents and creates a sustainable food system but can also provide many job and educational opportunities and attract more people to Westport. According to the SHAR (Self-Help Addiction Rehabilitation) program, a 30-acre urban farm will create 150 jobs in six months, and provide 2,500 to 3,500 permanent jobs for local residents in 10 years (PolicyLink, 2012). The site will also provide a good opportunity for students to learn about urban agriculture and the energy flow.

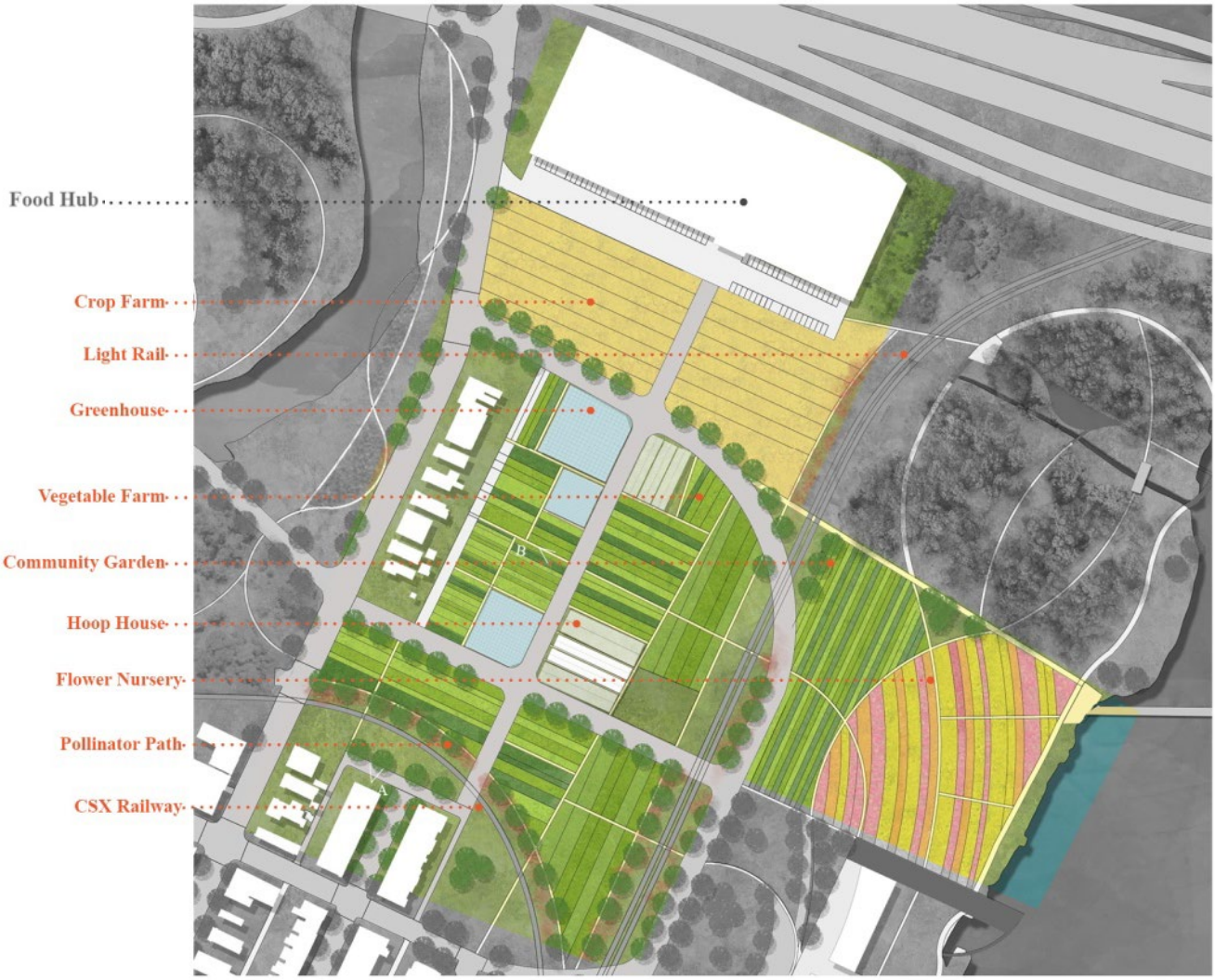


Figure 32: Proposed Urban Farm

Figure 33: Perspective of Urban Farm-Looking at the Existing Residential Area

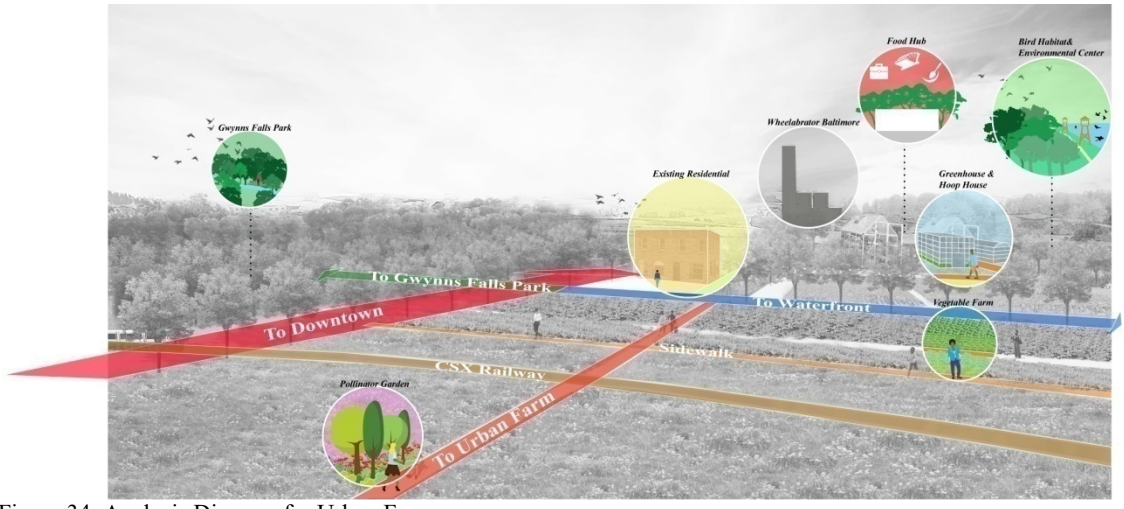


Figure 34: Analysis Diagram for Urban Farm


Figure 35: Perspective of the Proposed Urban Farm

Public Realm

The section dedicated to the public realm is connected to Wenburn Street, along the Light Rail Bridge (Figure 36). This section was placed in this area because it has the highest volume of visitors. The public realm area provides for recreational, educational and social activities, including a central plaza, traffic circle with plantation and seating area, piers for boats and fishing, a public park, visitor center,

community center, outdoor classroom, event lawn and outdoor restaurant. The central plaza is the major gathering space that provides seating and flexible space for people to get together and rest. The traffic circle, a drop-off space which combines with the plantation to offer a welcoming atmosphere for visitors, also guides them to explore the public realm and the waterfront recreational areas. The visitor center is a place for users to learn basic information about the waterfront. The outdoor classroom adjacent to it invites school children to learn and celebrate the site history and regional geology. The community center next to the visitor center is a neighborhood gathering destination for group activities, provides a community bond and combines with an event lawn, which is an expansive green space that provide flexible area for community events and connects residents with the waterfront.

Historic industrial buildings were demolished, but visitors can have a historical experience in the public park. The waterfront historically had been the site of glass manufacturing and energy production, today part of the CSX railway still cross the site from south to north. The design of this public park interprets the former use of this space through recycled industrial materials from the BGE (Baltimore Gas and Electric) substation, glass painting, a historic wall, a glass seating area, concrete artworks, and a dry fountain area combines with misting and lighting feature that reference the history of power plants and railways that ran through this waterfront. Along with reviewing the history of the waterfront, the public park can also provide a recreational space for users to engage in a variety of relaxing movements and embrace the future of this site. The outdoor restaurant between the community center and the urban farm and the public market provides a different way for users to engage

and connect with the waterfront through these spaces offering fresh food and products from the urban farm.

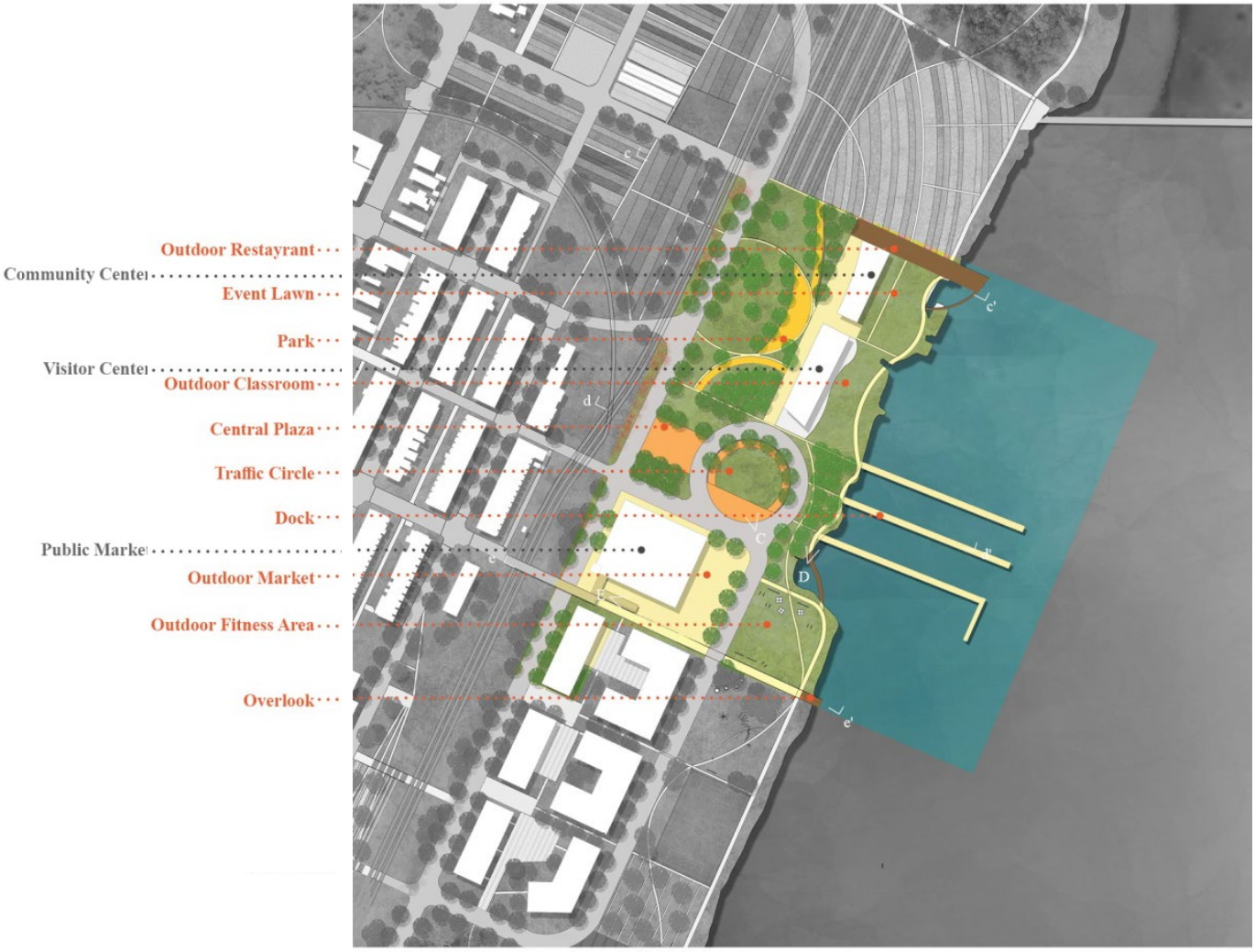


Figure 36: Proposed Public Realm

Figure 37: Existing and Proposed Section Cut from the Proposed Public Park (BGE Substation) to the Waterfront

Figure 38: Perspective of Proposed Traffic Circle and Plaza near the Light Rail Bridge

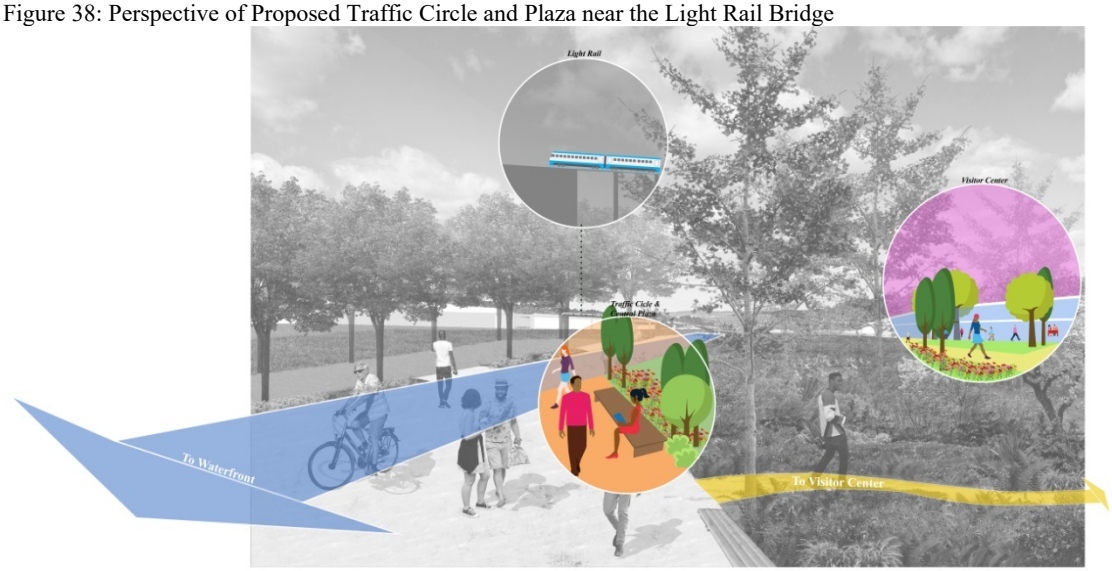


Figure 39: Analysis Diagram for the Proposed Traffic Circle and Plaza near the Light Rail Bridge

Figure 40: Existing and Proposed Sections Cut from the Light Rail Bridge near Wenburn Street to the Waterfront

Figure 41: Perspective of Biking on the River Walk

Figure 42: Perspective of Looking at the Proposed Pedestrian Bridge to the Proposed Public Market and the Waterfront

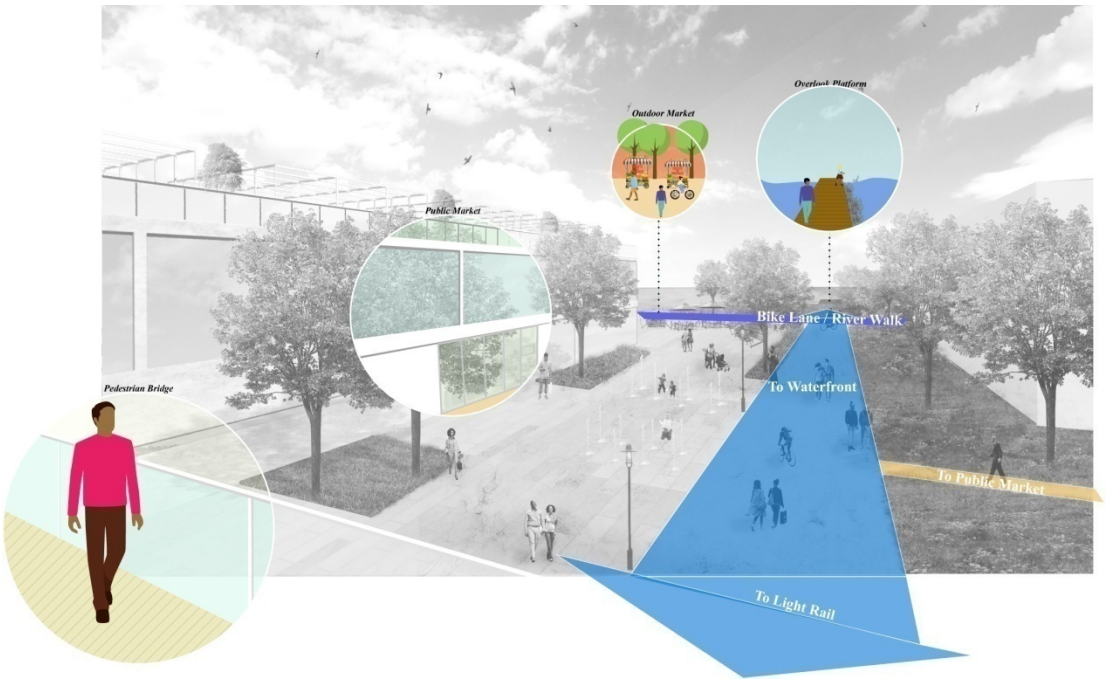


Figure 43: Analysis Diagram for the Above Perspective

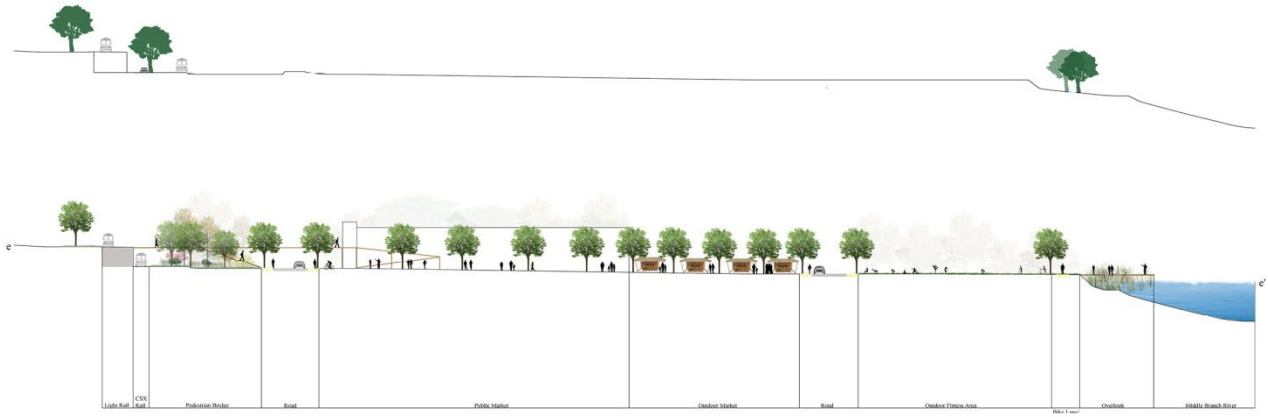


Figure 44: Existing and Proposed Sections Cut from the Light Rail Station to the Waterfront

Waterfront Recreation Spaces and Proposed Residential Area

Attracting people from all age groups and economic statuses to Westport and building connections between the existing neighborhood and the waterfront are crucial challenges to address.

The waterfront recreational spaces and proposed residential section spans from where the light rail bridge blocks the connection between the Westport neighborhood and

the waterfront to Waterview Avenue (Figure 45). The waterfront recreational spaces include a seating area, a sports field, a nature playground and an outdoor fitness area. These areas serve as a series of settings for waterfront entertainment that provides various waterfront experiences for visitors and residents. Users can have a variety of experiences as they are sitting close to the waterfront, playing at the sports fields and nature playground, and exercising at the outdoor fitness area.

Because this section is not within the 100-year floodplain, a mixed-income community will be proposed there. The proposed residential area will be composed of two parts. The first part includes apartments, condos, and affordable apartments near the Baltimore-Washington Parkway, because there is no residential areas in the back, these buildings will all six-floor buildings with retail and parking on the first floor. The second part is composed of four-floor townhouses and affordable housings. The proposed residential buildings will provide high quality living spaces for new residents, and will not bring a bad influence on the existing residential area. Building height control is used to guarantee visually access from the existing neighborhood to the waterfront. The matched color of the existing and proposed residential area also can create a unified visual experience to combine the existing and proposed neighborhoods.

In addition, in order to create connections between the existing and proposed community, there are several recreational spaces that will be created, including a strolling park near the existing residential area, several courtyards between the proposed buildings. These spaces function as relaxing gathering places for residents and visitors. The large continuous park system in the neighborhood also helps to build

a connection with the Middle Branch Park, allowing for a coherent recreational experience for residents and visitors.

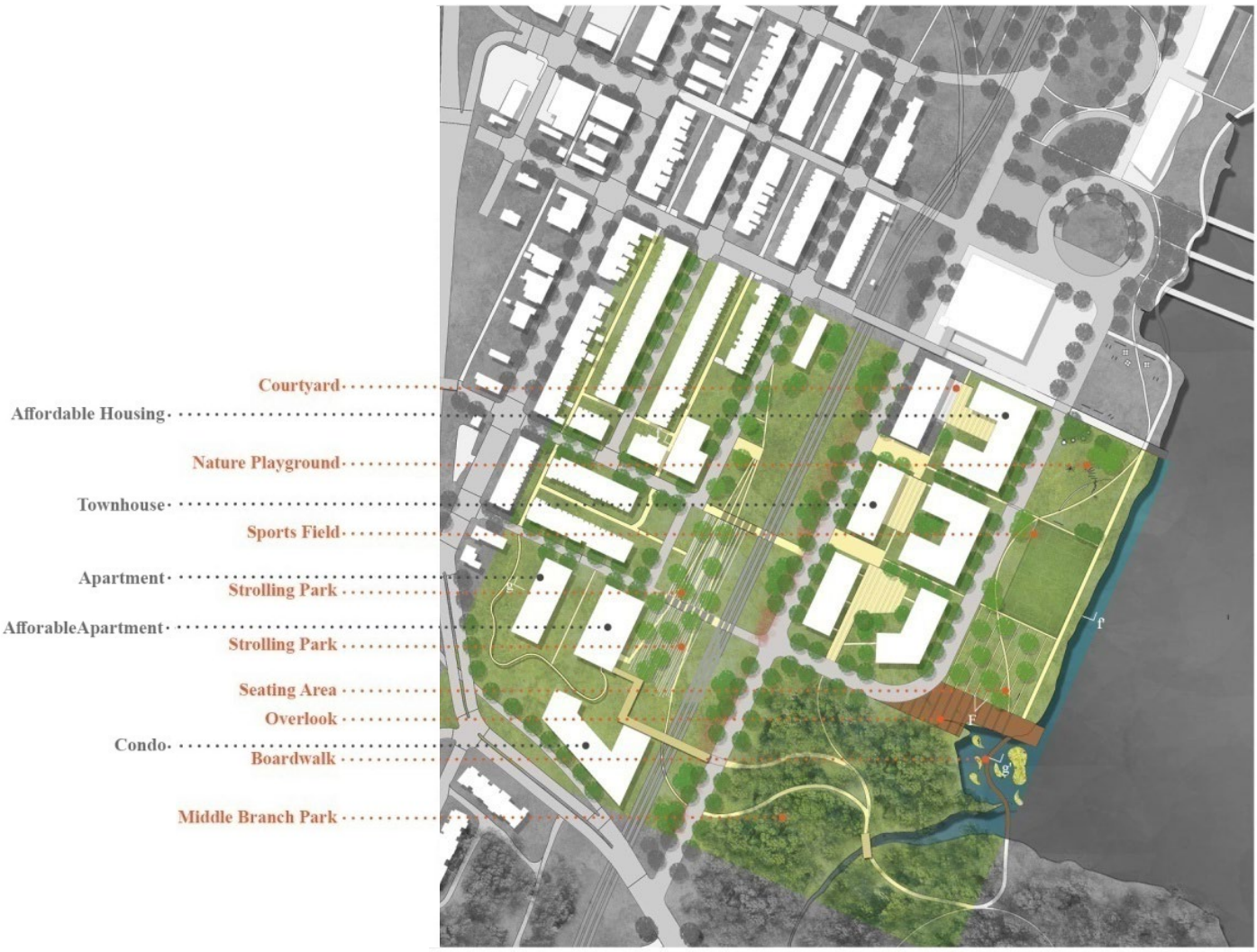


Figure 45: Proposed Waterfront Recreational Area and Proposed Residential Area

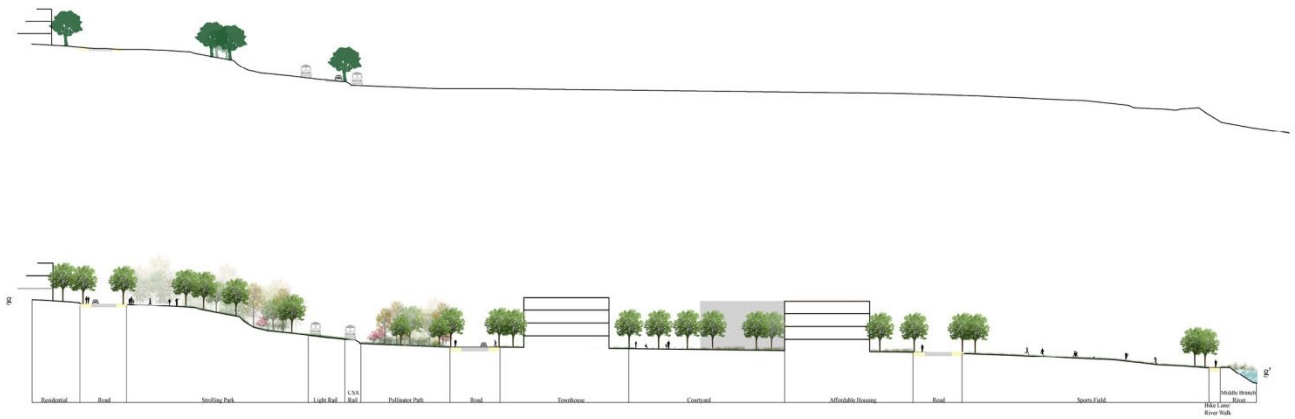


Figure 46: Existing and Proposed Sections Cut from the Existing Residential area near Maisel Street to the Waterfront

Figure 47: Perspective of the Proposed Waterfront Recreation Spaces and Proposed Community

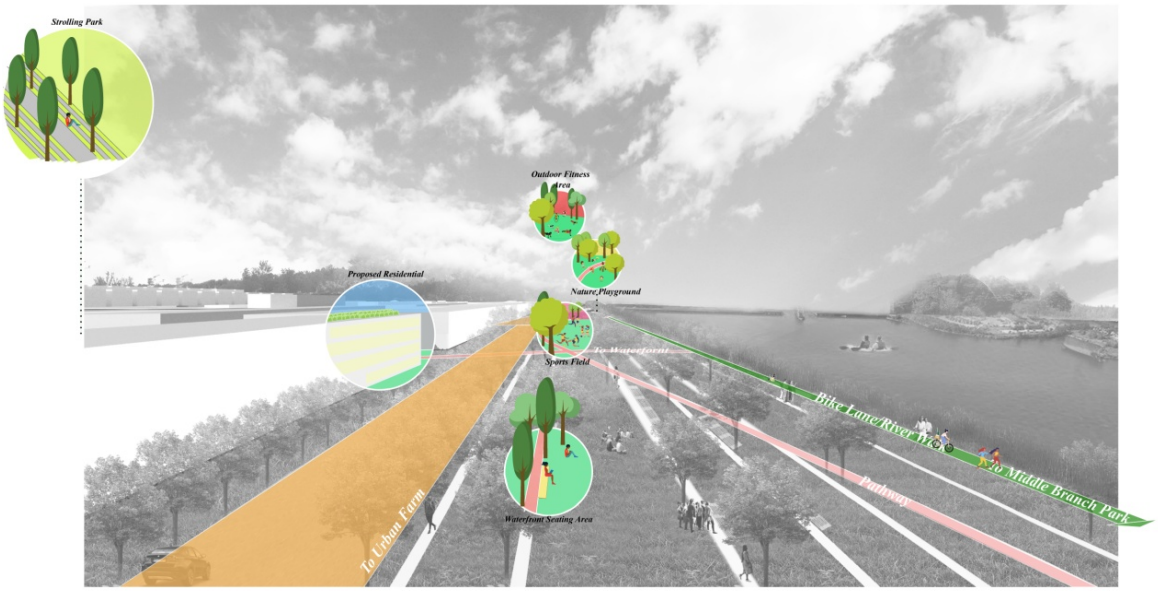


Figure 48: Analysis Diagram for Waterfront Recreation Spaces and Proposed Neighborhood

Figure 49: Existing and Proposed Sections Cut from the Proposed Residential Area (Indiana Park) to the Waterfront

Accessibility Improvement in the Waterfront

As far as project design and functional allocations are concerned, the transformation of the waterfront is meant to strengthen the connections within the site. The connection has already built between neighborhoods, such as between Westport and the city, which was mentioned in the previous chapter. In the site plan section, the plan suggests the improvement of the connections between the existing and proposed residential areas, between the community and the waterfront, between urban and more natural areas, and between different design programs. The proposed 1.5-mile long biking lane/river walk along the waterfront contributes to making the waterfront

accessible and connects various design programs with the Westport community (Figure 50 & 51). In addition, at that connection, there are few design challenges. The unused space on the south side of the waterfront and adjacent to Indiana Avenue has 28 percent steep slopes; after slope adjustment, this site has been transformed into a strolling park that offers smooth transitions from the existing neighborhood to the waterfront. The steep slopes and the light rail bridge result in the loss of a connection between the south Westport community and the waterfront. To deal with this condition, the plan decides to combines stairs, ramps, and pedestrian bridges to provide residents and visitors a welcoming atmosphere and guide them to the waterfront. It also creates a rich assortment of experiences for various users, multi-layered landscapes, as well as various destinations along the waterfront.

Figure 50: Proposed Cycling Circulation

Figure 51: Proposed Pedestrian Circulation

The public transit connection is considered in this design as well. Based on the existing bus system, the design suggests a new bus route to connect with the existing one, as well as to connect people with the waterfront through public transportation (Figure 52).

Figure 52: Existing and Proposed Bus Transit

Along with the physical connection, the design also creates visual connections from the neighborhood to the waterfront. Thoughtfully created visual corridors along roads

and the residential areas offer different perspectives for users to experience and appreciate the waterfront (Figure 53).

Figure 53: Physical and Visual Connections Diagram

In addition, through water-taxi or other water transportation, the Westport waterfront can connect to some important recreational spaces and the Baltimore City educational center (Figure 54).

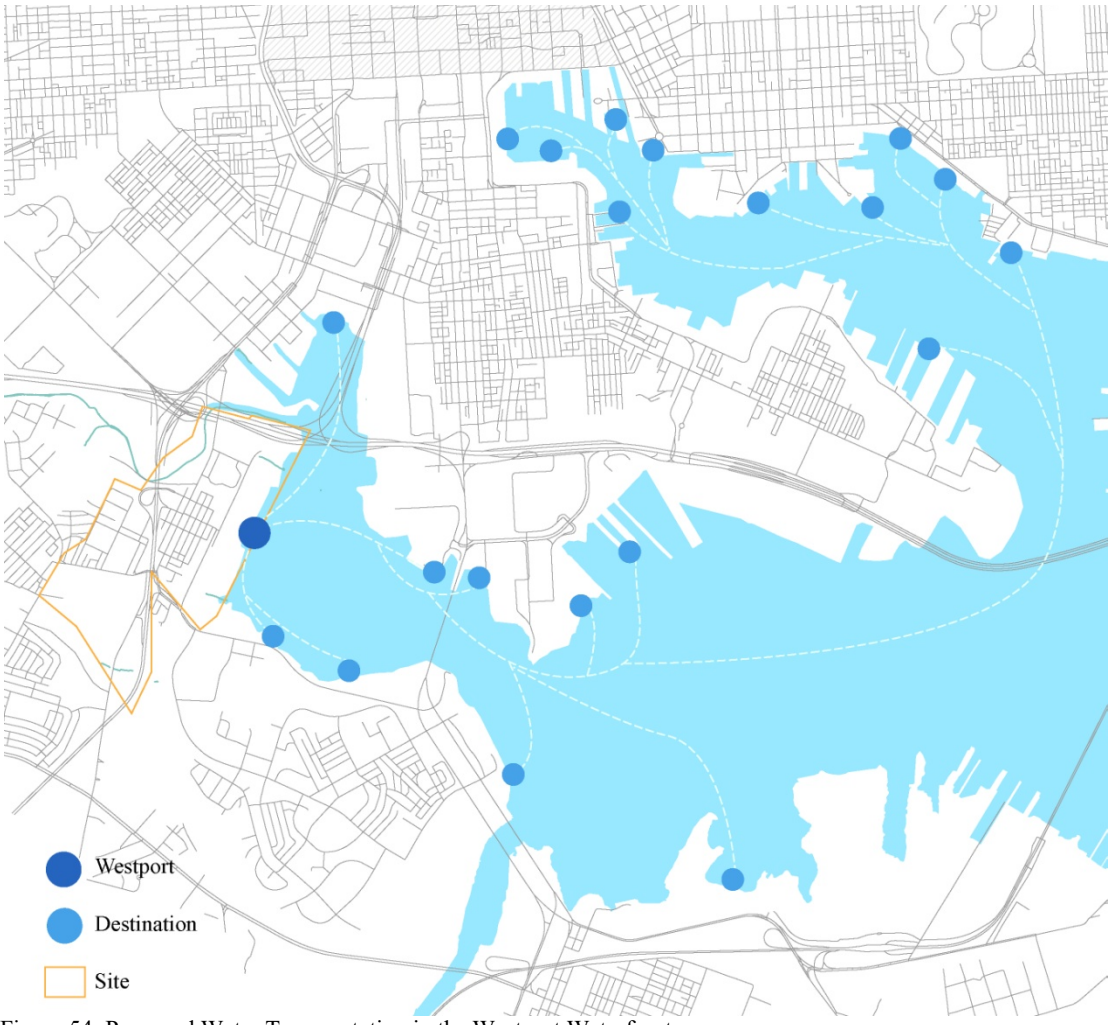


Figure 54: Proposed Water Transportation in the Westport Waterfront

Proposed Building Characteristics

It is of vital importance that building development necessitates and cares for, the needs of the residents and visitors. In order to create a harmonious and convenient community, the following building types will be included in the waterfront: multi-family residential, multi-family residential/retail, office/retail, public market, community center and visitor center (Figure 55).

The pie chart below compares the area and type of proposed buildings between Turner Development Group's proposal and mine (Figure 56). Except for the hotel/ office/ retail, community/culture buildings and public market, we both have multi-

family residential, multi-family residential/retail. In Turner's proposal, the hotel/ office/ retail is the largest portion in the built area. In my design, the multi-family residential/retail is the large portion.

Figure 55: Proposed Buildings and Functions

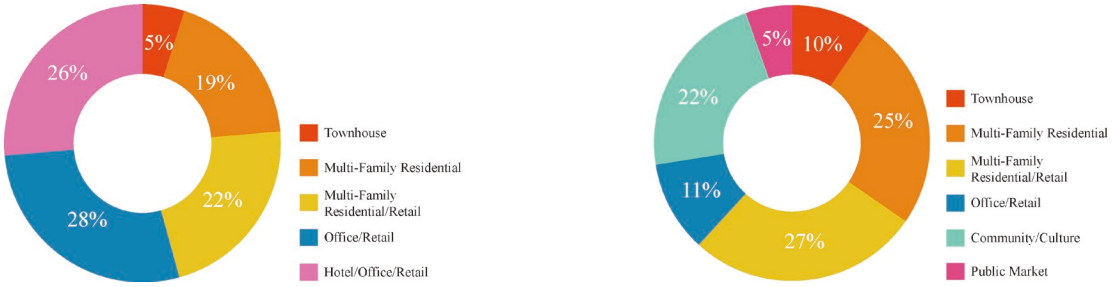


Figure 56: Comparison of Proposed Buildable Area

Stormwater Management

Figure 57 illustrates the water flow direction for Westport, where it shows runoff from Westport will flow into and contribute to the river pollution. To treat the site's stormwater runoff, the design proposes to implement several stormwater management strategies on site, including green roof gardens, bioretention cells, bioswales, cisterns, an algae farm and permeable pavements. To treat the stormwater running from the railways and roads, the design proposes pollinator paths along railways and roads.

The pollinator paths can not only perform as the pollinator garden, but can also function as a bioswale with phytoremediation plants, such as golden ragwort, silver maple and red maple, to remove pollutants from railways and roadway runoff. A possible solution for treating stormwater runoff from the roof is to apply roof gardens and implement cisterns to collect the runoff. Partial runoff from the roof will be absorbed by roof gardens, the remaining stormwater will flow into the bioswales connected to the buildings and collected by cisterns, which will be reused to irrigate the roof gardens. The algae farm in the urban agriculture section also can remove chemical pollution from runoff (Figure 58).

Figure 57: Water Flow Direction Diagram

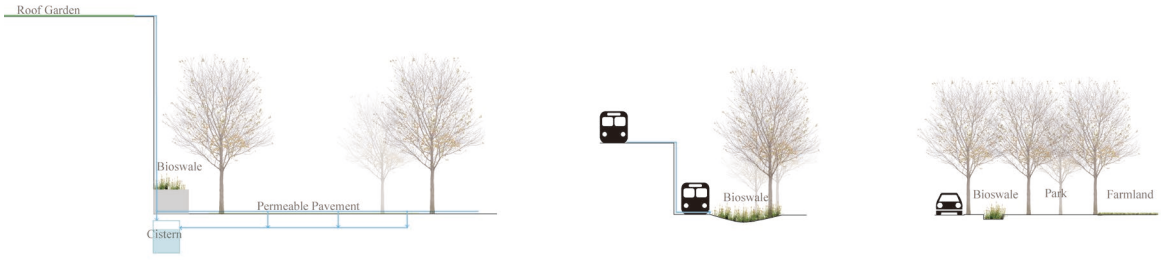


Figure 58: Stormwater Management Diagram

Chapter 6: Conclusion and Further Thoughts

In today's society, post-industrial sites redevelopment becomes a significant opportunity for environmental remediation and urban renaissance. Among these demands, post-industrial sites rejuvenation should not be limited to increase recreational opportunities and protect and improve ecological environment, but to improve the quality, to arouse of the spirit of the site and its surroundings. The best methods to achieve this is to view the site as a whole system, and have a comprehensive consideration of ecological, recreational, educational and economic factors and to apply them on the post-industrial site.

This thesis provides an alternative approach to redeveloping the post-industrial waterfront at Westport and explores how it can revive the spirit of a community. The design plan for this waterfront contributes to repurpose the post-industrial site as a comprehensive development waterfront with a bird habitat and environmental center, urban farm, public realm, waterfront recreational spaces and proposed residential area. It can activate the connections between the existing residents and the waterfront, the proposed residential area and the existing one, the Westport community and Baltimore City, and also build connections between separated habitat protection areas and form a unified park system.

The waterfront provides space for nature observation. The proposed bird habitat and environmental center will be created based on the existing historical bird habitat protection area. This will create a diverse set of habitats, such as an aquatic habitat, grassland habitat and woodland habitat, to offer various areas for bird and other species, and combines with recreational spaces like bird observation towers and an

overlook for visitors to observe the operation of nature. The urban farm is adjacent to the natural area, which not only can provide fresh food to residents and visitors, but also can create job, training and educational opportunities. Various types of thoughtfully placed various types of agricultural also can improve agricultural diversity. In addition, the reconstruction of social bonds, the community spirit can be achieved by working together as a community. New residential and commercial infill, and new high-quality affordable and market-rate housing will be created in the south of site. The waterfront also provides areas for active and passive recreation. As well as providing recreational spaces along the waterfront that help users to engage with the waterfront, the public realm and the waterfront recreational areas also connect the existing and proposed residential area, Middle Branch Park and Gwynns Falls.

The design plan for Westport waterfront will make this site a place like no other in this city, it uses different design program to weave the waterfront, with the surrounding parks and habitat protection areas, with the Westport community, with the nearby neighborhoods and with Baltimore City.

The design contributes to the further development the Westport's surrounding. The restoration of Gwynns Falls as a greenway park will offer a good opportunity for residents and visitors to explore this creek. This greenway park can also provide a corridor for wildlife. The proposed educational center and outdoor classroom can build connection with other environmental centers in Baltimore city, to develop various after-school programs for nearby students. In addition, through expanding urban agriculture to Port Covington or nearby neighborhood, food desert can be

eliminated, a joint urban agricultural system can be created to provide fresh food to the city, and more job opportunities will be provided.

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